

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

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|--|-------------------------|--------------------------------------|--|---|--|
| 1. REPORT DATE (DD-MM-YYYY) 08-02--2012 | | 2. REPORT TYPE Proceedings | | 3. DATES COVERED (From - To) 02-08-2011 to 04-08-2011 | |
| 4. TITLE AND SUBTITLE Proceedings of the 2011 AFMS Medical Research Symposium. Volume 1. Plenary Sessions, Presentation & Poster Abstracts | | | | 5a. CONTRACT NUMBER | |
| | | | | 5b. GRANT NUMBER | |
| | | | | 5c. PROGRAM ELEMENT NUMBER | |
| 6. AUTHOR(S) Welford C. Roberts, Ph.D. (Coordinating Editor), Lieutenant Colonel Cherri Shireman, Major Walter Cato, Ms. Velda Johnson, Mr. Andy Tesfazion | | | | 5d. PROJECT NUMBER | |
| | | | | 5e. TASK NUMBER | |
| | | | | 5f. WORK UNIT NUMBER | |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) | | | | 8. PERFORMING ORGANIZATION REPORT NUMBER | |
| 9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) US Air Force Office of the Surgeon General AF/SG9 5201 Leesburg Pike Falls Church, VA 22041 | | | | 10. SPONSOR/MONITOR'S ACRONYM(S) | |
| | | | | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) | |
| 12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; distribution is unlimited | | | | | |
| 13. SUPPLEMENTARY NOTES | | | | | |
| 14. ABSTRACT The U.S. Air Force Medical Service presented the sixth annual Air Force Medical Research Symposium coordinated by the Air Force Medical Support Agency's Research and Development Division (AFMSA/SGRS). The symposium was held 2-4 August 2011 at the Gaylord National Hotel & Convention Center, National Harbor, MD. The symposium featured two half-days of plenary sessions, one and a half days of scientific presentations, and a poster session. It was organized into five tracks to include: Operational Medicine (In-Garrison Care), Enroute Care and Expeditionary Medicine, Force Health Protection, Traumatic Brain Injury (TBI) and Psychological Health, and Healthcare Informatics. These proceedings are organized into six volumes to include one that provides a general overview and all presentation and poster abstracts; the other five each address a specific track. Volume 1 contains a general overview of the entire 2011 Air Force Medical Research Symposium and includes abstracts of all the oral presentations and posters, information and presentations from the opening and closing plenary sessions, symposium agenda, and attendee list. | | | | | |
| 15. SUBJECT TERMS US Air Force, Medical Service, Medical Research, Operational Medicine, In-Garrison Care, Enroute Care, Expeditionary Medicine, Traumatic Brain Injury, Psychological Health, Force Health Protection, Healthcare Informatics | | | | | |
| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT SAR | 18. NUMBER OF PAGES 145 | 19a. NAME OF RESPONSIBLE PERSON Nereyda Sevilla |
| a. REPORT U | b. ABSTRACT U | c. THIS PAGE U | | | 19b. TELEPHONE NUMBER (include area code) 703-681-6383 |

Proceedings of the
2011 AFMS Medical Research
Symposium
Volume 1. Plenary Sessions, Presentation
& Poster Abstracts



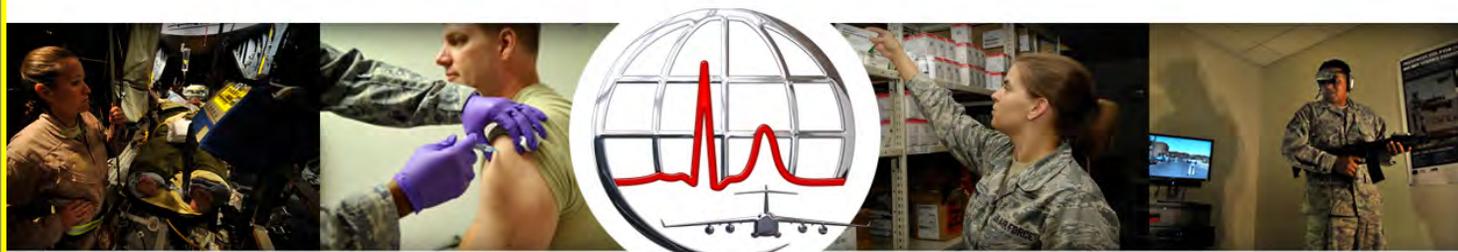
AIR FORCE MEDICAL SERVICE



2011 AFMS MEDICAL RESEARCH SYMPOSIUM

2-4 AUGUST 2011

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Proceedings of the 2011 AFMS Medical Research Symposium

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Proceedings of the 2011 AFMS Medical Research Symposium

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**Proceedings of the
2011 AFMS Medical Research
Symposium
Volume 1. Plenary Sessions, Presentation
& Poster Abstracts**

Edited by: Dr. Welford C. Roberts



**Held
2-4 August 2011
at the**

**Gaylord National Resort Hotel and Convention Center
201 Waterfront Street
National Harbor, MD 20745**



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Proceedings of the 2011 AFMS Medical Research Symposium Introduction

The U.S. Air Force Medical Service presented the sixth annual Air Force Medical Research Symposium coordinated by the Air Force Medical Support Agency's Research and Development Division (AFMSA/SGRS). The symposium was held on 2-4 August 2011 in the Washington DC area at the Gaylord National Resort Hotel and Convention Center in National Harbor, MD. The symposium featured two half-days of plenary sessions, one and a half days of scientific presentations, and a poster session.

The symposium was organized into several tracks to include Enroute Care, Force Health Protection, Healthcare Informatics, Operational Medicine (In-Garrison Care), and Psychological Health/Traumatic Brain Injury, as follows:

- The Enroute Care Track addressed science and technology targeted at the continuum of care during transport from point of injury to definitive care including, but not limited to: Casevac, Medivac; Aeromedical Evacuation; Critical Care Air Transport; and Patient Staging. Further areas addressed included: patient stabilization; patient preparation for movement; impact of in-transit environment on patient and AE crew physiology; human factors concerns for AE crew or patient population; AE/medical personnel training; infectious disease/control; burn management; pain management; resuscitation; lifesaving interventions; and nutrition research in the enroute care environment.
- The Force Health Protection Track focused on prevention of injury and illness and the early recognition or detection of emerging threats for in-garrison or deployed operations. Topics of interest include research in bio-surveillance, infectious disease, emerging threats (pandemic response), protective countermeasures, disaster response/consequence management, toxicology/health risks (e.g., particulates nanomaterials, radiation, etc.), monitoring disease trends, other areas of preventive medicine, public and environmental health relevant to the military workforce.
- The Healthcare Informatics Track focused on the use of innovative information management & technology solutions that enhance healthcare delivery at any point of the full spectrum of patient care to include medical simulation and training.
- The Operational Medicine (In-Garrison Care) Track focused on care delivered in the outpatient or inpatient in-garrison setting and on enhancing the performance of airman in challenging operational and expeditionary environments.
- The Psychological Health/Traumatic Brain Injury Track addressed topics pertaining to screening, diagnosis, and treatment of TBI and/or Psychological Health in the military community. Specific focus areas within Psychological Health included depression, substance use disorders, family functioning, and suicide prevention. Topics of special interest included field-deployable diagnostic tests for mild TBI (concussion), blast modeling, large epidemiologic studies of Psychological Health and TBI, and strategies for translating research into practice.

These proceedings are organized into five volumes, as follows:

- Volume 1. This volume is a general overview of the entire 2011 Air Force Medical Research Symposium and includes abstracts of all the oral presentations and posters. First presented is the symposium's opening plenary session, followed by the abstracts from the four technical tracks, and then the closing plenary session. The abstracts associated with the poster session are in the last section of these proceedings. The agenda for the overall symposium is in Appendix A, attendees are listed in Appendix B, and continuing education information is in Appendix C of this volume. Appendices D-J are copies of presentation slides from the plenary sessions.
- Volume 2. This volume contains abstracts and presentation slides for the Enroute Care and Expeditionary Medicine Track.
- Volume 3. This volume contains abstracts and presentation slides for the Force Health Protection Track.
- Volume 4. This volume contains abstracts and presentation slides for the Healthcare Informatics Track.
- Volume 5. This volume contains abstracts and presentation slides for the Operational Medicine (In-Garrison Care) Track.
- Volume 6. This volume contains abstracts and presentation slides for the Traumatic Brain Injury/Psychological Health Track.



Opening Ceremonies and Plenary Session

Tuesday, 2 August 2011

Opening and Keynote Presentations

| | |
|--|---|
| Brigadier General James Carroll Commander, Air Force Medical Support Agency | Welcoming Remarks |
| Lieutenant General Bruce Green Air Force Surgeon General | |
| Captain(Retired) Paul Bucha Congressional Medal of Honor Recipient | Keynote Presentation <i>Combat, Leadership, and Saving Lives</i> |

Plenary Presentations

**Presentation slides are in appendices as noted.*

| | |
|------------------------------|--|
| Colonel Elizabeth Bridges | <i>Medical Research: A Perspective from the Field (Appendix D)</i> |
| Colonel Christopher Robinson | <i>DoD's DCoE for Psychological Health & Traumatic Brain Injury Initiatives (Appendix E)</i> |
| Colonel Albert Bonnema | <i>What IT can do for the AFMS (Appendix F)</i> |



Presentation Abstracts



Operational Medicine (In-Garrison Care) Track

ABSTRACTS

Tuesday, 2 August 2011

1300 The Armed Forces Institute of Regenerative Medicine: Bone and Nerve Regenerative Programs

AFMS/SG

Brig Gen Michael Yaszemski

The Armed Forces Institute of Regenerative Medicine (AFIRM) is a consortium of military medical treatment facilities, academic clinical and research institutions, and industry partners. The consortium's goal is to provide novel treatment modalities for our nation's wounded warriors in five broad areas: limb reconstruction and regeneration, burn treatment, scarless healing, craniofacial reconstruction and regeneration, and skin regeneration. Several of the AFIRM projects have reached human use, and several more are poised to do so as AFIRM enters its fourth year in the Summer of 2011. This presentation will cover the AFIRM bone and nerve regeneration programs. The nerve regeneration scaffold consists of a biodegradable polymer that is fabricated into a tube and lined with bioactive molecules. A clinical study of 6 cm nerve defects will begin this year. The bone regeneration scaffold to treat segmental bone defects consists of a structural polymer that is fabricated into a porous three dimensional scaffold, surface coated with a calcium phosphate material, and which delivers bone growth factors in a controlled fashion to direct the new bone growth. This treatment enters large animal testing in 2011.

This partnership is committed to providing tools for optimum treatment of those colleagues who have been injured in the service of our country.

1330 Designing a Safer OR to ICU Hand-Off

81 MSGS/SGCX

Lt Col Broadus Atkins

Background: Clinical transfer of patient care from one medical unit/service to another is high-risk and error-prone. We examined a tertiary VA medical center's current OR-to-ICU handover protocols, quality, and provider satisfaction and reviewed available literature on

ICU patient transfers to redesign and standardize the handover process. Methods: After institutional approval, data were acquired through (1) observation of 50 OR-ICU handovers, (2) provider surveys eliciting perceived deficiencies and proposed modifications, and (3) 25 focus-group interviews evaluated with 'open coding' strategy. Methodical literature review was conducted using PubMed and ProQuest databases (keywords: 'handover', 'handoff', 'patient transfer' and/or 'post operative', 'post anesthesia', 'anesthesia', 'surgery', 'operating room', 'ICU', 'critical care', 'intensive care', 'surgical intensive care', 'admission', 'communication', and 'team'). Results: 500 published manuscripts were reviewed; 30 (6%) focused on postoperative handovers; 14 manuscripts provided evidential support for proposed solutions to handover difficulties. Handover observations, survey reviews, and interview analysis revealed that technical handover processes were often compromised by ineffective communication (simultaneous conversations or task performance during handover, artificial distractions, inconsistent role participation, inattention due to time pressure), poorly coordinated task prioritization, and incongruous priorities of task performance and information exchanged between transferring and receiving teams. A new, standardized model for OR-ICU handover was devised. Conclusions: Previous OR-ICU handover processes were flawed and not uniformly conducted. Using these data, a redesigned handover, based on structured verbal reporting and establishment of a communication platform, was constructed. High-fidelity patient simulation will allow testing, staff training, and tool refinement prior to clinical introduction of the new handover process.

1400 Variations in the Management of Hypertension in Active Duty Airmen – JNC7 Revisited

AFMSA/SG6H

Dr. Celan Alo

A cross-sectional retrospective design was employed to describe the management of hypertension by estimating the patterns of use of antihypertensive agents and lifestyle modification (LSM) counseling in a cohort of

hypertensive patients among active duty airmen (ADAF). We compared available data for 2003 and 2009. All eligible ADAF were screened and classified as having hypertension based on two elevated blood pressure (BP) readings, diagnostic information in the form of ICD 9CM codes, and prescription drug use from pharmacy dispensing records. All available BP data were extracted from the Preventive Health Assessment and Individual Medical Readiness (PIMR) files. For this study, we only included the most recent documented BP reading during the reporting calendar year. For each study year, we compared the its representative BP reading with the following year's representative BP measurement to identify those with hypertension based on two elevated BP readings. Data show that the number of ADAF who were hypertensive or had BP in the hypertension range increased significantly from 7 percent in 2003 to 9 percent in 2009 ($p < .0001$). Of these, 91 percent are either diagnosed or treated and about 9 percent are untreated. About 33 percent of study subjects had any LSM counseling. Only 16 percent of study subjects who were receiving antihypertensive drugs were on thiazide diuretics while a large proportion was receiving ACE inhibitors (28 percent) followed by beta blockers (17 percent). Overall BP control rate was 80 percent.

1445 Readiness Optimization through Surgical Outcomes Surveillance **USAF MC** **Lt Col John Tokish, MD**

Disease and non-battle injuries (D/NBI) of the musculoskeletal system pose a threat to readiness at the unit and individual levels within the US Military. It is known that "in-garrison" musculoskeletal conditions are highest contributor to medical profiles, disability, and separation from military service. Conservative estimates of musculoskeletal D/NBI from 2002 – 2010 within the military active component were 75,000 in the knee and 40,000 in the shoulder. Additionally, 150,000 surgeries to correct these injuries were performed from 2004-2010. To date, a Department of Defense (DoD) surveillance program for musculoskeletal D/NBI or for the surgical outcomes to treat these injuries does not exist. A recent literature review found that cost-benefit studies (using return to duty as the outcome measure) which examine the efficacy of surgical interventions to treat D/NBI musculoskeletal injuries are lacking. In 2004, the Society of Military Orthopedic Surgeons sought to address this void in the literature and the persistent lack of evidenced-based medicine to support surgical decisions to treat musculoskeletal D/NBI; both within the context of the DoD mission. The DoD's powerful electronic medical records within the Military Health System (MHS) afford the exceptional opportunity

to develop a surveillance program for such. This presentation will encompass the development of such a surveillance program that is being led by the US Air Force. Included will be the regulatory and privacy requirements that have been met to establish this central database using health care data from MHS as well as future directions.

1515 Prevention of Low Back Pain in the Military (POLM) cluster randomized trial **US Army-Baylor University** **Lt Col John Childs, Associate Professor**

BACKGROUND: Effective strategies for the primary prevention of low back pain (LBP) remain elusive. The prevention of low back pain in the military (POLM) cluster randomized trial investigated whether core stabilization and/or brief psychosocial education were effective in preventing future LBP episodes.

METHODS: Companies of Soldiers were randomly assigned to receive a core stabilization exercise program (CSEP) alone, a CSEP with brief psychosocial education program (PSEP), a traditional exercise program (TEP) alone, or a TEP with PSEP. The randomly assigned programs were performed during 12 week Advanced Individual Training (AIT). Soldiers were followed monthly for 2 years to determine self-report (onset and severity) and health care utilization related to initial LBP episode. **FINDINGS:** Twenty companies consisting of 4,325 Soldiers were enrolled in the trial. There were no differences among the exercise and education programs for self-report of occurrence and severity of LBP during the subsequent 2 years. There was decreased health care utilization related to LBP from the PSEP. This effect was noted in both exercise programs resulting in an overall 3.3% decrease in LBP related health care utilization over 2 years (NNT = 30.3). **INTERPRETATION:** Results from the POLM trial suggest that exercise and education approaches may not offer protective benefit for the development of self-reported LBP. However, decreased health care utilization from LBP may be attainable with education programs that reduce the fear and threat of LBP. Future trials should investigate cost-benefit and determine if larger dosages of psychosocial education result in larger decreases in health care utilization.

FUNDING: Peer-Review Medical Research Program of the Department of Defense (PR054098).

Trial registration: NCT00373009

**1545 Spinal Injuries Following Ejection
81st AMDS/SGPF
Lt Col Richard Blair**

Vertebral fractures are common in those ejecting from aircraft. High G forces experienced during ejection place significant loading on the vertebral column. The lower thoracic vertebrae are most commonly injured followed by lumbar vertebrae. Following is a case study a student pilot whom ejected from a USAF T-6 Texan training aircraft and sustained a compression fracture of the fifth vertebrae. Initial radiographic studies performed following ejection sequence failed to identify a compression fracture of the fifth thoracic vertebrae. The fracture was diagnosed two weeks later via MRI after patient complained of non-resolving mid back pain. The Royal Air Force identified compression fractures in 30-70% of those whom ejected from aircraft. Fractures suffered during ejection are stable in nature and treatment is conservative. The RAF routinely performs MRI of the spinal column on all those whom eject from aircraft. The USAF may be well served in the future to adapt a similar policy in order to avoid a delay in diagnosis of vertebral fractures in those ejecting from aircraft.

Wednesday, 3 August 2011

**0800 A New Paradigm for Conducting
Air Force Research Air Force Diabetes
and Obesity Research Working Group
59 MDOS/SGO5E
Lt Col Mark True**

INTRODUCTION: Diabetes mellitus is costly and presents a major burden on Military Treatment Facilities (MTFs). There are insufficient clinicians to effectively manage the 47,000 AFMS patients with diabetes mellitus, and over 100,000 patients with pre-diabetes. Research is needed to determine the optimal use of personnel and technology to affect the greatest good for these populations. **METHODS:** A call for multi-base participation in diabetes research occurred in April 2009, and attendees responded with great interest. AFMSA/SG9 contracted for research coordinators at six Air Force MTFs. Formal research priorities were established in Feb 2010, laying the groundwork for future activities. The Air Force Diabetes and Obesity Research Working Group was formally chartered in November 2010. Its membership consists of clinicians and research coordinators from Andrews, Keesler, Lackland, Nellis, Travis, and Wright-Patterson AFBs.

RESULTS: The working group produced a Research Development Document, which defines research priorities; Working Group Charter; Annual Plan; and Strategic Plan. The research priorities include: Primary Prevention of Diabetes, Technologies to bridge current resource gaps, Models of care to improve outpatient care, Inpatient diabetes care, Biomarkers to define diabetes populations, and Safety/operational concerns. The working group also established a coordinated framework by which research concepts are structured and pursued within these priorities. To date, over 10 new research projects have been established. Of note, 4 multi-base trials are underway. **CONCLUSIONS:** The Air Force Diabetes and Obesity Research Working Group can serve as a effective synergistic model for structuring, conducting, and accomplishing research within the Air Force Medical System.

**0830 Delivering a Diabetes Prevention
Program in a Military Setting
59 MDOS/SGO5E
Maj Lisa Strickland**

OBJECTIVE: Diabetes prevention is an important consideration for the military. Lifestyle coaches were trained by the University of Pittsburgh Diabetes Prevention Support Center to implement the Group Lifestyle Balance (GLB), an adaptation of the Diabetes Prevention Program intervention, in two US Air Force settings. Our objective was to determine if GLB delivered to military healthcare beneficiaries resulted in reduction of risk factors and program satisfaction.

METHODS: The GLB intervention was delivered by face to face group classes or through the GLB DVD over 12 weeks. Program goals are to achieve/maintain weight loss and increase activity. Anthropometric (height, weight, blood pressure, and waist circumference) and laboratory (fasting glucose, triglycerides, and HDL) were collected at baseline and 12 weeks. Satisfaction surveys were administered at 12 weeks.

RESULTS: Thirty-two participated in the face to face GLB; 55 in the GLB DVD interventions. Program attendance rates declined over time. Participants in the face to face lost a median 4.4 lbs; had an average BMI decrease 0.75 kg/m², both statistically significant. Participants in the GLB DVD intervention lost a median 8.9 lbs, had a decrease of BMI 1.5 kg/m², and median reduction in waist circumference by 3.81 cm, all statistically significant. There was high program satisfaction.

CONCLUSIONS: Albeit a limited time frame and sustained program attendance, GLB can be considered a viable evidence-based risk reduction program for eligible military beneficiaries. The GLB program is an effective tool to implement lifestyle change for diabetes prevention. Further research is needed to explore motivational tools to improve adherence.

**0900 USAF Obesity Educator Program
MDOS (Hurlburt AFB, FL)
Dr. Thomas McKnight**

Obesity is an epidemic that cost Americans more than \$168 billion dollars per year. The TOBESAHOL Study estimates the DoD 's annual medical cost of obesity and overweight at \$1.1 billion. In 2007, 12.4 percent Air Force personnel had a body mass index 30 or greater. Active duty members are at risk for administrative discharge for being over body fat. In 1999, 600 airmen and women were discharged for being over body fat. The Diabetes Prevention Program and the Look Ahead Study show 7 to 10 percent sustained weight loss greatly improves health. The National Weight Control Registry (NWCR), with over 5,000 registrants, has shown long-term weight management is achievable. The average NWCR registrant lost 66 lbs and kept it off >5 years. Less than 5 percent used medication. In 2006, the Certification Board of Obesity Educators (CBOE) was established to promote continuing commitment to best practices, standards of care, and knowledge of obesity counseling and education techniques. Curriculum for the certification exam is under development. During this session I propose a pilot study where Air Force healthcare professionals (physicians, nurses, dieticians, social workers, and psychologists) are trained as obesity educators to assist Air Force personnel to lose weight and maintain a healthful weight.

**0945 Intraosseous Infusion Rates Under
High Pressure: A Cadaver Study of
Anatomical Site Comparisons
711 HPW/USAFSAM-ETS
Maj Joe Dubose**

BACKGROUND: Modern combat injuries often involve injuries to the extremities and torso, limiting the ability of medics to obtain intravenous access for resuscitation. Therefore, combat medics are trained in the use of intraosseous (IO) devices for the delivery of resuscitative fluids after combat injury. However, the optimal site of insertion for these devices (tibia, humerus, or sternum) has not been well established.

HYPOTHESIS: The optimal site or sites for IO vascular access in humans, using devices and sites currently being employed in theater, can be objectively determined using a fresh cadaver model. **METHODS:** "Fresh" cadavers, flushed with intravascular detergent solution immediately after arrival to the morgue and stored in a holding area at 34-36 degrees Celsius until use within 24 to 48 hr, will be utilized for study. IO infusion devices will be sited in the proximal tibia, proximal humerus, and sternum. The FAST-1 (Pyng

Medical Corp., Richmond, British Columbia, Canada) and EZ-IO (VidaCare Corp., San Antonio, TX), which are U.S. Federal Drug Administration approved for sternal (FAST-1) and humeral or tibial site (EZ-IO) and commonly employed in combat theaters by field medics, will be utilized. A 0.9% saline solution will be infused at each site in turn, where the volume infused over 5 min using a pressure infuser inflated to 300 mmHg will be measured. Mean flow rates for each site will be calculated and used to compare mean rates of flow achievable using the three sites of access in this model. This study will be completed in 8 months.

**1015 Intraosseous hydroxocobalamin
versus intramuscular hydroxylamine in a
validated swine model of acute cyanide
toxicity and shock
59 EMDS
Lt Col Vikhyat Bebarta**

Background: Non-intravenous routes of cyanide (CN) antidotes are needed as an easily administered antidote for first responders and military troops. **Objective:** To compare the return to baseline of mean arterial blood pressure (MAP) between 2 groups of swine in acute CN toxicity and treated with IO HOC or IM HAM. **Methods:** 24 swine (48-52 kg) were intubated, anesthetized, and instrumented. CN was infused until severe hypotension. Animals were randomly assigned to IO HOC or IM HAM and monitored for 60 min.

Results: Baseline mean weights, time to hypotension, and CN dose at hypotension were similar between groups. At hypotension mean MAP (42, 42 mg Hg), blood CN (3.2, 2.9 mcg/ml) and lactate levels (7.4, 7.8 mmol/L) were similar. 12/12 animals in the IO HOC group and 9/12 in IM HAM group survived (p=0.11). IO HOC resulted in a faster return to baseline (p < 0.001). Bicarbonate, pH, and lactate, levels were similar. Methemoglobin (1.2% IO HOC, 12.8% IM HAM) and CN levels (0 in IO HOC, 15.5 mcg/ml in IM HAM) were greater in the IM HAM group (p < 0.001). Cerebral NIRS oxygenation decreased was similar in both groups after antidote (p=0.78). Serum nitrotyrosine rose during CN infusion in all animals, but was lower in the IO HOC group at 60 min (p=0.03). TNF-a, IL-1b, IL-6 and IL-10 were similar.

Conclusions: Intraosseous hydroxocobalamin led to a faster return to baseline mean arterial blood pressure compared to intramuscular hydroxylamine. Mortality with the intramuscular hydroxylamine group was greater..

**1045 Resuscitation with Hextend Leads
to Diminished Inflammation as**

Compared to Hespan in Hemorrhagic Shock

711 HPW/USAFSAM-ETS

Dr. Timothy Pritts

PURPOSE: Hemorrhagic shock is the leading preventable cause of traumatic death. Recent studies have shown that hemorrhagic shock is associated with a dysfunctional inflammatory response and that this response can be affected by resuscitation strategy. CCR1 is a chemokine receptor that is important in inflammatory cell activation and recruitment. It is activated by both CCL3 (MIP-1 α) and CCL5 (RANTES). Hetastarch (6%) is a colloid resuscitation fluid and is available dissolved in normal saline as Hespan or in Lactated Ringer's as Hextend. We hypothesized that resuscitation with Hextend would lessen the inflammatory response to hemorrhagic shock as compared to Hespan. **METHODS:** Mice underwent femoral arterial cannulation and hemorrhage using a pressure-clamp model to a mean arterial pressure of 25 mmHg. After 1 hr of hemorrhagic shock, mice were resuscitated with normal saline, Lactated Ringer's, Hespan, or Hextend. The mice were then sacrificed at intervals to collect serum. Serum was analyzed by multiplex ELISA for cytokine analysis. **RESULTS:** Mice resuscitated with Hextend had a lower level of CCL3 than mice resuscitated with Hespan at 30 min (112.3 vs. 606.3 pg/mL, $p < 0.05$). At 4 hr, mice resuscitated with Hextend had a lower level of CCL5 compared to Hespan (54.6 vs. 203.8 pg/mL, $p < 0.05$). In further investigation, this did not appear to be simply the result of carrier solution alone. **CONCLUSION:** Mice resuscitated with Hextend had a diminished inflammatory response among the activators of CCR1 as compared to Hespan at both early and late time points. Resuscitation with Hextend in place of Hespan may decrease the inflammatory response to hemorrhagic shock.

1245 Epidemiology of Respiratory Illness During Basic Cadet Training at the U.S. Air Force Academy: Implications for Future Research and Prevention

U.S. Air Force Academy

Lt Col Catherine Witkop

BACKGROUND: Respiratory symptoms are responsible for over half of all medical visits during Basic Cadet Training (BCT) at the U.S. Air Force Academy (USAFA) each year and can impact training and duty availability. Cough is the predominant symptom. Environmental conditions and infection have been proposed as possible etiologies. Our objective was to determine if a pathogen was associated with

respiratory symptoms during BCT. **METHODS:** This cross-sectional study compared cadets in three groups: (1) FRI (febrile respiratory illness); (2) ARI (afebrile respiratory illness); (3) control (presenting with other than respiratory chief complaint). Each subject completed a questionnaire including demographics, pre-existing medical history, and current symptoms. Nasal wash and throat swab specimens were evaluated by PCR for detection of adenovirus, influenza, rhinoviruses, and other pathogens. Clinical information was abstracted from the medical record. Infection rates were calculated and compared between groups. **RESULTS:** 129 cadets were included. Cough was reported as a symptom in 115/129 cadets, including 10/12 FRI, 88/99 ARI, and 17/18 controls. Rhinovirus was detected in 56/129 (43.4%) of subjects, including 51/115 (44.3%) of those with cough and 5/14 (35.7%) of those without cough. Adenovirus was only detected in one cadet at levels consistent with possible infection. **CONCLUSIONS:** Rhinovirus was identified in almost half of cadets studied. It was not significantly associated with cough, although there were very few cadets without cough in this study. Further study is warranted to test for factors such as altitude, environment, and immune status and to evaluate possible preventive measures, with implications for deployed troops.

1315 Virulence and Resistance Trends of Staphylococcus aureus in an Outpatient Military Population

59 MCCS SGOBV

Capt Corey Falcon

Skin and soft tissue infections due to community-associated methicillin resistant Staphylococcus aureus (CA-MRSA) pose a clinical challenge due to their increasing incidence and virulence. This epidemiologic study was undertaken to determine the occurrence of virulence and resistance factors in S. aureus isolated from an outpatient population in San Antonio, TX. A total of 200 S. aureus isolates from samples submitted for culture from outpatient clinics over 5 months in 2009 were tested for the presence of mecA, mupA, TSST-1, and PVL genes using EVIGENE qualitative nucleic acid hybridization assays. Antibiotic susceptibility profiles for each of the isolates were obtained. Results show that 50% of the isolates were MRSA. The prevalence of PVL was 56%. 84% of the MRSA isolates were positive for PVL while 29% of the MSSA isolates demonstrated PVL. Only 4% and 7% of the isolates carried the mupA and tsst-1 genes respectively. The MRSA burden in our community is significant. The data suggests that Mupirocin remains an option for the elimination of S. aureus nasal carriage. There appears to be an increasing incidence of Panton-Valentine leukocidin in S. aureus strains, especially MRSA. Interestingly, the majority of

isolates with toxic shock syndrome toxin were methicillin sensitive *S. aureus*. Ciprofloxacin, Levofloxacin, and Erythromycin should not be used to treat *S. aureus* infections in this population. There is a significant occurrence of inducible Clindamycin resistance in the MRSA strains. Bactrim and Tetracycline are viable antimicrobial options for treating *S. aureus* in our community.

**1345 Automation and Assessment of a Whole Blood Interferon Gamma Release Assay (IGRA) for LTBI Screening: The USAF-CDC TB Collaboration 711HPW/USAFSAM-PHR
Dr. Donald Goodwin**

BACKGROUND: In 2006, a USAF-CDC TB Collaboration set out to enhance TB diagnostics. By April 2010 it had automated an IGRA (the QFT-GIT); completed three clinical trials to comparatively assess performance of the QFT-GIT with the TST; and, completed enabling SBIR software development efforts.

METHODS: The USAF led, multiple-sector, multiple-site, multiple-partner collaboration established laboratories at USAFSAM and at CDC's Division of TB

Elimination. Private sector partners were engaged with CRADAs and contracts. Three IRB approved clinical trials were subsequently completed. Centralized IT support enabled coordinated quality assurance monitoring which optimized data quality and analytic efficiencies. Use of on-site coordinators, weekly conference calls, periodic site visits, and data/specimen exchanges enabled synchronization of efforts, validation of observations, and timely problem solving.

RESULTS: Trial #1 automated the QFT-GIT and produced an experience-refined testing protocol used to support mass LTBI screening among 2,367 USAF basic military trainees. Problems identified in Trial #1 were addressed in Trials #2 and #3.

Trial #2 assessed reproducibility of the TST and QFT-GIT (automated and manual) and measured impacts attributable to: specimen collection; antigen mixing; processing variability; diurnal variation of IFN γ concentrations; serial testing; and, inter-laboratory variability (USAF, CDC, and Tripler AMC). Test concordance/discordance was described; and, boosting with serial testing assessed.

Trial #3 documented specimen volume variability impacts on clinical results, and a work-around assessed.

DISCUSSION: Assessments considered both statistical and clinical significance. The SBIR effort yielded a 21 CFR Part 11 compliant, automation-facilitating software usable on any automated ELISA platform for producing validated, electronically reportable QFT-GIT results.



Enroute Care and Expeditionary Medicine Track

ABSTRACTS

Tuesday, 2 August 2011

1300 Effects of Aeromedical Evacuation on Intracranial Pressure
711 HPW/USAFSAM-ETS
Mr. Richard Branson

PURPOSE: Early evacuation of casualties has been a hallmark of the current conflict, with traumatic brain injury (TBI) being the defining injury. The effects of aeromedical evacuation (AE) on intracranial pressure (ICP) have not been studied in humans. **METHODS:** ICP and blood pressure were both continuously recorded during AE from in-theater hospitals to Germany in six patients with TBI. All patients were mechanically ventilated and had an intraventricular catheter and arterial lines. A recorder with airworthiness approval was connected to the output of a standard pressure transducer. Data were collected every second. The recorder also measured X, Y, and Z via an integral accelerometer. **RESULTS:** Six patients had complete take-off to landing data collected. In four of six patients there were sustained increases in ICP associated with take-off and/or during the 6- to 8-hr flight. These increases were often >50% from baseline and were sustained for >1 hr. However, no patient suffered sustained ICP increases >20 mmHg. All data were collected without identifiers and no attempt was made to link the collected data to patient information from medical records. **CONCLUSIONS:** This study demonstrates that observational data from current standard of care environments can be invaluable in identifying potential problems and solutions. Routine AE is associated with increases in ICP owing to environmental and injury factors. Monitoring during AE is possible without altering patient care.

1330 Prolonged Hypobaria During Aeromedical Evacuation and the Effects on Traumatic Brain Injury
711 HPW/USAFSAM-ETS
Dr. Gary Fiskum

BACKGROUND: Warfighters evacuated from combat theaters are exposed to decreased atmospheric pressure (hypobaria) during air transport. The focus of this project is to characterize the effects of hypobaria associated with aeromedical evacuation (AE) on animals subjected to traumatic brain injury (TBI) and test for clinically translational neuroprotective interventions targeted at these conditions. **HYPOTHESIS:** We hypothesize that (1) low atmospheric pressure present at AE cruising altitudes worsens outcome after TBI, (2) the effects of prolonged hypobaria on outcome after TBI are dependent upon timing of transport, (3) these effects reflect neuroinflammatory and/or cerebral metabolic changes, and (4) the neurologic outcome after TBI and AE can be improved by interventions that target neuroinflammation and brain oxygenation. **STUDY DESIGN:** Animals will be exposed to prolonged hypobaria (6 hr at 0.75 ATA), beginning at different times after TBI (6, 24, or 72 hr), representing immediate evacuation, standard, or delayed AE after injury in theater. Additional groups of animals will be exposed to primary hypobaria and then prolonged secondary hypobaria, modeling AE from Europe to the U.S. Two clinically relevant TBI models will be examined: (1) contusion-induced moderate TBI using the rat lateral fluid percussion model and (2) mild, blast-induced hyperacceleration TBI in rats as a model for TBI in occupants of vehicles hit by improvised explosive devices. Comparisons of long-term histopathologic and behavioral outcomes for animals in these groups will provide data to suggest the optimum time for primary and secondary AE after TBI, as well as the impact of poly-ADP-ribose polymerase administration or hyperoxia on subsequent outcome.

1400 Critical Care Air Transport Team Severe Traumatic Brain Injury Short-Term Outcomes During Flight for Operations Iraqi Freedom/Enduring Freedom Between June 2007 and August 2010

711 HPW/USAFSAM-FEEG
Lt Col L. Renee Boyd

A retrospective chart review was conducted for 560 patient movements (i.e., Balad to Landstuhl, Landstuhl to Bethesda) transported by critical care air transport teams (CCATTs) with severe traumatic brain injuries (TBIs) between 1 June 2007 and 31 August 2010. Severe TBI was defined by the Brain Trauma Foundation and classified based on loss of consciousness that lasts for more than 24 hours, post-traumatic amnesia lasting for 7 days or longer, and a Glasgow Coma Score of 8 or less. Records were obtained from the CCATT Pilot Unit at Wilford Hall Medical Center, Lackland AFB, TX, and a standardized abstraction form was utilized that included the following: age; sex; nature of injury such as blast, blunt, or penetrating; additional traumatic injuries; type of mechanical ventilation; and intracranial monitor intervention (ventriculostomy or ICP CODMAN monitors). Results of this study serve to expand the available aeromedical knowledge by specifically looking at the area of TBI to allow refinement of CCATT training and provide data for the future development of guidelines for air transport for validating and clearing flight surgeons.

1445 Closed Loop Control of FIO₂ in Multiple Trauma Patients

711 HPW/USAFSAM-ETS
Mr. Richard Branson

PURPOSE: Closed loop control (CLC) of inspired oxygen concentration (FIO₂) may maintain oxygenation and conserve oxygen.

Methods: In a randomized cross-over trial, we compared a 4-hr period using standard of care (SOC) physician-directed FIO₂ control to 4 hr of CLC of FIO₂ in trauma patients. CLC was accomplished using a proportional-integral-derivative (PID) controller targeting oxygen saturation (SpO₂) at 94±2%. The PID controller manipulated FIO₂ to maintain the SpO₂ target. A paired t-test was used to compare the variables between SOC and CLC groups.

Results: A total of 95 patients (82 men, 13 women; 76 white, 18 African-American, and 1 Asian) were enrolled.

Mean [± standard deviation (SD)] age was 36±12 yr and mean ISS was 32 (range 16-50).

Mean oxygen usage was 1.5 L/min in CLC and 2.84 L/min during SOC (p< 0.0001). The mean (± SD) of total time in minutes per patient per 4-hr period with SpO₂ ≤ 88% was 0.55±1.37 with a range of 0-12.2 min in CLC and 1.28±2.64 in SOC with a range of 0-17.3 min (p<0.002). There were 91 low SpO₂ events in the SOC group and 77 in the CLC group.

CONCLUSION: CLC of FIO₂ provides consistent control of the target SpO₂ without clinician intervention, which may offer advantages in the en route care setting.

1515 Prehospital Oxygen Use in Civilian Trauma Care

711 HPW/USAFSAM-ET
Mr. Richard Branson

BACKGROUND: Trauma patients often receive prehospital oxygen (O₂) without evidence of hypoxemia. Knowing the need for prehospital O₂ could assist military planners. **METHODS:** A convenience sample of injured adults taken to a trauma center by six emergency medical services (EMS) agencies was studied. During transport, O₂ saturation (SpO₂) was continuously recorded. Prehospital and in-hospital O₂ use were recorded. A conservative threshold for O₂ need (SpO₂<95%) was used to estimate maximum prevalence and defined per local EMS protocols. Analysis using the TCCC threshold of SpO₂<90% was also performed. Categorical comparisons used chi-square or Fisher's exact tests; medians were compared with the Mann-Whitney U test. **RESULTS:** Of 290 screened patients, 154 had complete data. The median age was 37 (range 18-84), 77/154 (50%) were white, and 121/154 (79%) were male. The median injury severity score (ISS) was 5 (1-43), 55/154 (36%) had a penetrating injury, and 82/154 (53%) were admitted. During treatment 128/154 subjects (83%, 95% confidence interval 76%-88%) had a need for O₂ where 113/154 (73%) had SpO₂<95%, 52 (34%) were <90%, and 86/154 subjects (67%) received O₂ during EMS transport. Those with O₂ need were older (38 vs. 27 years; p=0.019) and had higher ISS scores (9 vs. 1; p=0.001). There was no difference in O₂ need for those with or without penetrating (36% vs. 40%, p=0.684) or chest (27% vs. 19%, p=0.469) injuries.

CONCLUSION: At threshold of SpO₂<95% and SpO₂<90%, 30%-50% of civilian trauma patients required O₂. The need for O₂ remains sufficient to deploy some oxygen for those casualties who may benefit from supplemental oxygen.

1545 Task Saturation in Critical Care Air Transport Team Advanced Training 11 HPW/USAFSAM-ETS
Dr. Timothy Pritts

BACKGROUND: An important part of the current combat casualty care paradigm is tactical and strategic aeromedical evacuation of critically ill patients. Care of critically ill patients in this environment, as delivered by Critical Care Air Transport Teams (CCATTs), is challenging and involves the execution of a myriad of tasks. The current experience of CCATT has led to increasing understanding of the challenges of task saturation in complex environments, but the occurrence of task saturation in the CCATT training environment is unknown. This study will increase our knowledge of the occurrence and nature of task saturation during simulated CCATT missions and will provide the groundwork for potential improvements in CCATT training to mitigate the effect of task saturation on patient care. **HYPOTHESIS:** We hypothesize that task saturation occurs during simulated CCATT missions.

STUDY DESIGN: We seek to increase our understanding of task saturation in the CCATT environment. This will be accomplished through observation of patient care during simulated CCATT missions from at least four consecutive CCATT advanced classes. This will establish the practicability of task saturation occurrence determination during simulated CCATT missions. We will then determine the potential effects of task saturation on loss of team effectiveness during simulated CCATT missions. We will gather data from four consecutive CCATT advance classes. Data will be obtained prospectively but analyzed in detail by a panel of educational and team training experts in a retrospective fashion over 6 months.

Wednesday, 3 August 2011

0800 The Impact of Prophylactic Fasciotomy Following Porcine (Sus scrofa) Hind Limb Ischemia/Reperfusion Injury
Brooke Army Medical Center
Capt Thomas Percival

BACKGROUND: Prophylactic fasciotomy has been used alleviate compartment syndrome after ischemia reperfusion injury. It has been proposed that prophylactically treating compartment syndrome will improve neuromuscular recovery of the limb therefore improving functional limb outcome. The purpose of this study is to quantify the neuromuscular recovery after

prophylactic fasciotomy in a porcine model of hemorrhage and hind limb ischemia. **METHOD:** Swine (Sus Scrofa; 76 +/-6kg) were randomly assigned to no fasciotomy or prophylactic fasciotomy after ischemia via external iliac artery occlusion and arteriotomy. Class III shock was induced via a 35% blood volume variable rate hemorrhage and external iliac artery repair was achieved after 0, 3, or 6 hours of ischemia. Prophylactic fasciotomy of the anterior compartment was performed at the time of reperfusion. Compound motor action potential, sensory nerve action potential, nerve conduction velocity and gait testing was evaluated during the 14-day survival period to calculate the composite physiologic model of recovery (PMR). Necropsy was performed for evaluation of nerve and muscle histology. **RESULTS:** In hemorrhage alone, according to the PMR the recovery was 94+/-28%, 63+/-37% and 55+/-44% at 0, 3 and 6 hours of ischemia respectively. A significant difference was noted between 0 and 6 hours of ischemia ($p<0.05$). With fasciotomy, a recovery of 97+/-72%, 98+/-80% and 42+/-39% was noted after 0, 3 and 6 hours of ischemia. Compound motor action potential showed the greatest decrement with ischemic insult. Histologic analysis is currently on going. **CONCLUSION:** This study demonstrates the feasibility of fasciotomy in a porcine model. It validates the previous model of functional limb outcome with hemorrhage and hind limb ischemia in a porcine model and shows an apparent trend towards improved functional limb outcome if vascular repair and prophylactic fasciotomy are performed within 3 hours of ischemic time.

0830 A Nursing Research System to Obtain Functional Outcomes and Provide Clinical Education Following Wartime Extremity Vascular Injury
USAISR

Capt Diane Lynd

Authors: Ivatury RA, Keltz BM, Lynd DL, Ames-Chase AC, Porras C, RasmussenTE, Feider LL

BACKGROUND: The rate of vascular injury in the wars in Iraq and Afghanistan are five times that previously reported in combat with extremity injury most common. Extremity vascular injury is associated with significant long-term morbidity and repairs requiring surveillance ensure best durability and outcome. Despite the commonality and significance of this injury pattern, current systems to ascertain patient-based outcomes and provide education are poorly developed. **OBJECTIVE:** To describe a novel system designed to contact troops in the years following extremity vascular injury to ascertain quality of life and

limb outcomes and provide education on surveillance of vascular repair.

METHODS: A research team comprised of nurses with wartime experience conducted a review of the Joint Theater Trauma Registry (JTTR) identifying US troops having sustained extremity vascular injury. A medical record review was performed to confirm the presence of vascular injury and or injury repair and patient contact attempted. Informed consent was obtained and outcomes information was gathered using the Standard Form 36 (SF-36) and Short Musculoskeletal Function Assessment (SMFA). Vascular injury education was provided based on an algorithm that directs follow-up and surveillance.

Results: Extremity vascular injury was confirmed in 751 patients. Attempted contact of 189 (25%) and actual contact completed for 91(48%). Of the 91 patients contacted, 80 (88%) consented to participate, and 11(12%) either declined consent or were unresponsive. Of the 80 consented, 24 (30%) completed surveys and 56 (70%) are pending survey completion. Of the 24 respondents, 17 had salvaged limb with graft or patch or anastomosis primary repair and received education regarding the need for follow-up care with a vascular surgeon. **CONCLUSIONS:** Nursing-driven outcomes research and education are feasible following wartime injury. This method provides relevant insight into extent of recovery following injury on the battlefield and allows this information to be linked to early injury characteristics and management strategies.

The opinions or assertions contained herein are the private views of the author and are not to be construed as official or as reflecting the views of the Department of the Army or the Department of Defense.

0900 Major Arterial Vascular Injuries Sustained During Combat Operations: Demographics, Outcomes, and Lessons To Be Learned from Contrasts to Civilian Counterparts **Brooke Army Medical Center** **Capt Nicholay Markov**

INTRODUCTION: Vascular injuries account for 12% of all combat-related injuries in recent conflicts in Iraq (OIF) and Afghanistan (OEF). We reviewed the epidemiology and outcomes of these injuries from the Joint Trauma Theater Registry (JTTR), contrasting these results with civilian counterparts from the National Trauma Databank (NTDB). **METHODS:** JTTR query identified major arterial vascular injuries (Non-compressible = axillary, subclavian/innominate, aorta, carotid, iliac; Compressible = brachial, femoral, popliteal) in coalition casualties from 2002-2006. The demographics, patterns and severity of outcomes of these injuries were evaluated and compared to civilian NTDB counterpart's age 18-35 using Propensity Score

matching. **RESULTS:** JTTR identified 380 patients meeting criteria. The majority of injuries were the result of an explosion (68.7%) or GSW (28.2%). GCS was ≤ 8 in 34.3%, ISS > 15 in 44.5%, and 20.5% had hypotension (SBP < 90) on arrival to a theater hospital. Comparison to unmatched NTDB patients meeting study criteria (n = 7400) revealed that JTTR patients were more likely to have sustained arterial injury at compressible sites (55.5% vs. 38.6%, $p < 0.001$) and were more likely to have concomitant venous injury (54.5% vs. 18.4%, $p < 0.001$). Comparison of 167 propensity score matched (1:1) JTTR to NTDB counterparts revealed a significantly lower mortality rate among JTTR patients overall (4.2% vs. 12.6%, $p = 0.006$; OR 0.30 [0.13-0.74]), those with arterial injury at non-compressible sites (10.8% vs. 36.5%, $p = 0.008$; OR 0.21 [0.06-0.71] and for ISS > 15 (10.7% vs. 42.4%, $p = 0.006$; OR 0.16 [0.04-0.65]). **CONCLUSIONS:** Comparison to civilian counterparts has inherent limitations, but reveals improved survival among combat-related vascular injuries overall, for non-compressible arterial injuries and among the most severely injured. The etiology of these findings is likely multi-factorial and warrants further investigation.

0945 Advanced Team Training for Long-Range Extracorporeal Support Transport: The San Antonio Military Adult ECLS Team experience **59 MDW** **Lt Col Jeremy Cannon**

BACKGROUND: Combat casualties with severe respiratory failure may require extracorporeal life support (ECLS) to permit safe long-range transport. To meet this need, a transport team trained in ECLS indications, physiology, and equipment is required. This report summarizes the training activities of the San Antonio Military Adult ECLS Team over the previous 10 months. **METHODS:** Physicians and nurses with experience in combat casualty care, advanced critical care therapies, and long-range transport were identified as potential candidate ECLS team members. Training included didactic modules on the indications for extracorporeal support, modes of support, and troubleshooting. Hands-on simulation and live tissue training reviewed circuit setup and emergency scenarios. Expert instructors for these sessions were drawn from well-established military and civilian ECLS teams.

RESULTS: To date, 7 physicians, 10 nurse specialists, and 1 clinical nurse specialist have been selected for training as candidate members of the San Antonio Military Adult ECLS Team. Of these 18 candidates, 18 (100%) have completed a didactic course, 10 (56%) have undergone simulation training, and 11 (61%) have

participated in at least 1 live tissue training session. More nurse candidates have completed hands-on simulation training than physician candidates (70% vs. 43%) while fewer nurses have participated in live tissue training as compared to physicians (30% vs. 100%).

CONCLUSIONS: Establishing a team capable of long-range ECLS transport requires intensive training in cardiopulmonary physiology and ECLS equipment and techniques. Military and civilian teams experienced in neonatal, pediatric, and adult ECLS have worked over the past 10 months to provide our candidate team members the knowledge and skill to perform ECLS in garrison and during transport. Future efforts will focus on completion of simulation and live tissue training, maintenance of qualifications, and bedside experience with ECLS patients.

1015 Morphometric analysis of the torso arterial tree in a male trauma population Brooke Army Medical Center Capt Nicholay Markov

INTRODUCTION: Management of torso hemorrhage may include resuscitative aortic occlusion to support central pressure while bleeding is temporized. The objective of this study is to characterize axial arterial anatomy of the torso in a trauma population including definition of distances and diameters correlated to an external measure of torso extent. **METHODS:** Two-hundred consecutive contrast-enhanced CT scans of the chest abdomen and pelvis performed for trauma in men (April 2009 –April 2010) were examined. One hundred eight scans qualified for analysis using Volume Viewer™ software. Centerline distances were measured between the common femoral arteries (CFA) and the origin of the primary branch vessels of the aorta additionally the aortic diameter at each point was determined. **RESULTS:** The mean age of patients was 31.5 (19-45) years. Mean distances and ranges from the left and right common femoral arteries to arterial landmarks are as follows: Left Common femoral artery to the left subclavian artery, celiac artery take off and aortic bifurcation were 537mm (472-632mm), 327mm (290-413mm) and 207mm (146-281mm) respectively. Right common femoral artery to the left subclavian artery, celiac artery take off and aortic bifurcation were 546mm (484-622mm), 335mm (274-412mm) and 201mm (165-278mm) respectively. The diameter of the thoracic aorta at the level of the left subclavian artery was 21.6 mm (16.3 mm-26.9 mm). Aortic diameters at the level of the Celiac and aortic bifurcation are 17.3 mm (12.3 mm-22.5 mm) and 14.1 mm (10 mm-18.1 mm) respectively. The diameter of the right and left external iliac arteries was 8.9 mm (5.1 mm-12.5 mm) and 8.8 mm (4.8 mm-12.8 mm) respectively. **CONCLUSION:** This study provides the first CT-based morphometric analysis

of the torso arterial tree. Information from this study may facilitate the development and accurate implementation of resuscitative endovascular aortic balloon occlusion without the need for fluoroscopy.

1045 Porcine Arterial Repair with an Extracellular Matrix Bioscaffold (CorMatrix® ECM™) USAF / 60 MDG

**Capt Brian Gavitt, Capt Matthew Chauviere, Capt Geoffrey Douglas, Capt Ryan Schutter, LtCol Daren Danielson, Col Jerry Pratt, Col(sel) Darrin Clouse, Maj Megan Steigelman, W. Douglas Boyd MD, J. Kevin Grayson DVM, PhD
Department of Surgery, David Grant Medical Center, Travis AFB, CA
Clinical Investigation Facility, David Grant Medical Center, Travis AFB, CA
Department of Surgery, UC Davis Medical Center, Sacramento, CA**

OBJECTIVE: Options for immediate peripheral vascular reconstruction are limited. Autogenous vein may not be available and is difficult to procure. Prosthetic materials have significant complication profiles in contaminated wounds, limiting their use in vascular trauma. We evaluated an alternative graft material consisting of a porcine-derived extracellular matrix (ECM) bioscaffold (CorMatrix® ECM™, CorMatrix Cardiovascular, Inc., Atlanta, CA). Our study sought to establish early patency and histologic characteristics of CorMatrix® ECM™ for use in arterial repairs in swine. **METHODS:** Four crossbred swine had a 2 cm carotid arteriotomy created through a midline neck incision. The arteriotomy was repaired with a CorMatrix® ECM™ patch. Aspirin and clopidogrel were administered starting 48 hours prior to surgery and continued daily. Angiography was performed prior to euthanasia and followed by thorough necropsy and histologic evaluation. **RESULTS:** The animals had uncomplicated postoperative courses. Swine were sacrificed at one and four weeks after surgery. Arteriograms confirmed graft patency in all cases. Histologic assessment confirmed patency without evidence of thrombosis. The ECM patch was well populated with cells by one week. The implanted patch material was largely reabsorbed at 4 weeks and replaced by site-appropriate tissue consisting of organized smooth muscle, collagen, and endothelium. Neovascularization was seen within the remaining patch material. **CONCLUSION:** In this pilot study, CorMatrix® ECM™ was an effective material for porcine carotid arterial repairs. ECM remodeling begins within one

week and elements of normal vascular structure are seen. Further studies will be required to assess long term patency and elucidate the mechanisms of site-appropriate remodeling. **DISCLAIMER:** The animals involved in this study were procured, maintained, and used in accordance with the Laboratory Animal Welfare Act of 1966, as amended, and NIH 80 23, Guide for the Care and Use of Laboratory Animals, National Research Council. The views expressed in this material are those of the authors, and do not reflect the official policy or position of the U.S. Government, the Department of Defense or the Department of the Air Force. The work reported herein was performed under United States Air Force Surgeon General approved Clinical Investigation No. FDG20100034A. The opinions and/or assertions expressed in this article are solely those of the authors and do not reflect the official policy of the U.S. Air Force, the Department of Defense, or U.S. government.

1245 Prehospital interventions performed in a combat zone between November 2009 and December 2010
Enroute Care Research Center
Lt Col Vikhyat Bebarta, MD

OBJECTIVE: To describe prehospital interventions performed during the resuscitation of casualties in a combat zone. **METHODS:** We performed a prospective observational study recording: mechanism of injury (MOI), application of nasal/oral airway, endotracheal intubation or cricothyroidotomy, chest needle decompression, chest tube placement, chest seal application, tourniquet, use of pressure packing with/without hemostatic agent and implementation of hypotensive resuscitation. In 2010 we added: vascular access, fluid administration, hypothermia prevention and use of TCCC card. The enrolling provider determined if an intervention was not performed that was necessary (missed LSI). All data was reported in a descriptive manner. **RESULTS:** 652 patients met the inclusion criteria; mean age was 25 yrs (SD 8) and 97.4% were male. The MOI was explosion in 413 (63.3%), penetrating in 138 (21.2%) and blunt in 101 (15.5%). 39 casualties underwent an airway intervention (6.0%), with 34 (5.2%) missed LSIs; 30 underwent a chest intervention (4.6%), with 13 (2.0%) missed LSIs; 369 (13.3%) underwent a hemorrhage control intervention with 21 (3.2%) missed LSIs and 25 (3.8%) had hypotensive resuscitation applied with 8 (1.2%) missed LSIs. Vascular access was obtained in 206 of 339 casualties (60.8%) with 79 (23.3%) missed LSIs. Prehospital hypothermia prevention was employed on 244 of 339 casualties (72%) and 58 (17.1%) had their TCCC card turned in. The primary limitations include the nature of enrollment being a convenience sample and the descriptive nature of the study.

CONCLUSION: This represents the largest collection of prehospital interventions performed during the resuscitation of casualties in a combat zone.

1315 Factors Associated with US Military Died Of Wounds Rate in Iraq and Afghanistan
USAIR
CPT Shimul Patel

BACKGROUND: Died of wounds (DOW) rates are cited as a measure of combat casualty care effectiveness but do not account for patterns of trauma or battlefield lethality. The objective of this study is to identify injury patterns, injury severity, and mechanism of injuries that prevail in months of higher DOW rates.

Methods: Highest (HDOW) and lowest (LDOW) monthly DOW rates from 2004-2008 were identified from Department of Defense casualty databases and used to direct a search of the Joint Theater Trauma Registry. Casualties from HDOW and LDOW were combined into cohorts and injury data analyzed and compared.

RESULTS: HDOW rates were 13.4%, 11.6% and 12.8% [mean=12.6%]; LDOW rates were 1.3%, 2.0% and 2.7% [mean=2.0%] ($p < .0001$). HDOW (n=541) and LDOW (n=349) groups sustained 1,154 wounds (head-24%, chest-12%, abdomen-10%, extremities-37%). Overall injury severity score (ISS) was greater in HDOW than LDOW (11.1 ± 0.53 vs. 9.4 ± 0.58 ; $p = 0.03$), as were casualties with ISS > 25 (HDOW: 12% vs. LDOW: 7.7%; $p = .04$). Excluding minor injuries (AIS=1), HDOW had a greater percentage of chest cell injuries than LDOW (16.5% vs. 11.2%, $p = .03$). Improvised explosive devices were more common causes of injury in HDOW (58.7% vs. 49.7%; $p = 0.007$) which also had a greater proportion of Marine Corps service affiliation casualties ($p = 0.02$).

CONCLUSIONS: This study provides novel data demonstrating variations in died of wounds rates. Discernable differences in injury severity and wounding patterns are associated with large differences in DOW rates. Fluctuations in DOW rates may be more a reflection of enemy activity than a gauge of combat casualty care.

1345 Critical Care Air Transport Team (CCATT) short term outcomes of casualties with spinal fractures moved with the Vacuum Spine Board between 2009 and 2010

59 MDW

Lt Col Vikhyat Bebarta, MD

OBJECTIVE: To describe the outcome of patients managed by CCATT with the Vacuum Spine Board (VSB) to stabilize unstable spine fractures between July 2009 and June 2010. **METHODS:** We performed a retrospective chart review evaluating short term events/outcomes of casualties transported on the VSB by CCATT. Complications and the Injury Severity Score (ISS) were obtained from the Joint Theater Trauma Registry (JTTR). All data was reported in a descriptive manner. **RESULTS:** 73 patients met the inclusion criteria, resulting in 107 patient moves. The MOI was explosion in 48 (65.8%), blunt in 22 (30.1%) and penetrating in 3 (4.1%). The mean ISS was 23.5 (SD 13.4). 64 patients were ventilated (59.8%), 10 received vasoactive medications (9.4%), and 13 received blood products (12.2%). Regarding complications: 10 had skin breakdown associated with the VSB (9.3%) and there were 2 cases of neurological deterioration which were attributed to progression of the original neurological insult (1.9%). There were 3 episodes of transient desaturation (2.8%) and 13 of transient hypotension (12.2%). We did not encounter any deaths, loss of airway or chest tubes. The primary limitations include the retrospective and descriptive nature of the study as well as the small number of casualties studied.

CONCLUSION: The VSB was successfully used to stabilize spine injuries during transport. We did note a skin breakdown rate of 9.3%. A risk/benefit assessment must be performed before deciding to use the VSB to transport casualties with spine injuries.

1430 Continuous Noninvasive monitoring and the Development of Predictive Triage Indices for Outcome Following Trauma

711 HPW/USAFSAM-ETS

Dr. Colin Mackenzie

BACKGROUND: Expeditionary military triage uses basic vital signs of mental state, heart rate, and perfusion pulse pressure. Technological progress allows collection of increasing amounts of patient physiologic data that may be used to provide continuous monitoring of triage parameters. **HYPOTHESIS:** Continuous noninvasive vital signs data collected in the first hour of trauma patient resuscitation predict resuscitation requirements and identify necessity for major life saving interventions

(LSIs) and 48-hr patient outcomes. Critically abnormal values ("No-Fly" decision-makers/triage tool) can be determined for several different variables derived from the photoplethysmographic (PPG) waveform and from absolute values of pulse oximetry data for injured patients by application of signal processing. **SPECIFIC AIMS AND STUDY DESIGN:** Employ continuous noninvasive vital signs data (pulse oximetry, blood pressure, electrocardiogram, and respiration) collected in trauma patients during their initial 1 hr of resuscitation after admission and assess sensitivity, specificity, and predictive value in predicting LSIs within 24 hr of admission. Calculate surrogate measures of perfusion (perfusion index, pulsatility, variability, pleth variability index, and O₂ delivery index) and derive trends and absolute values of total hemoglobin [Hb] from PPG waveforms. Compare bleeding diagnoses, shock, and fluid resuscitation needs identified by these surrogate values to predictions obtained from invasive measures of [Hb], lactate, acid-base status, and O₂ delivery. Compare the outcomes at 48 hr with predicted outcomes obtained from analyses of pulse oximeter and other vital signs signals, injury severity score, and revised trauma score predictions of outcome. Compare analyses based on trends of vital signs data versus those based on analyses of continuous waveforms.

1500 Efficacy and Safety of Frozen Blood for Transfusion in Trauma Patients, A Multicenter Trial

711 HPW/USAFSAM-ETS

Ms. Samantha Underwood

BACKGROUND: Blood transfusion is one of the most commonly utilized life saving therapies in combat casualty care. Blood stored up to 42 days develops a "storage lesion" that may impair organ perfusion. Transfusion is associated with increases in multiorgan failure and mortality. Our laboratory has shown that older blood (ORBC) causes decreased tissue oxygenation (StO₂). Cryopreserved blood (FRBC) is prepared from 2- to 6-day-old blood and allows for longer storage periods, and the process of deglycerolizing and washing FRBC after thawing appears to remove cells with abnormal morphology and pro-inflammatory mediators. The effects of FRBC on perfusion, biochemical changes, inflammatory changes, and clinical outcomes in recipients have not been studied. **HYPOTHESIS:** We hypothesize that transfusion of FRBC will be superior to transfusion of ORBC with respect to physiologic, biochemical, and clinical parameters but will not be inferior to transfusion of younger red blood cells (YRBC) with respect to the same parameters. **STUDY DESIGN:** We will prospectively study 288 trauma patients requiring a blood transfusion at six Level 1 trauma centers over a 1-

yr period. Subjects will be randomized to receive FRBC, YRBC (≤ 14 days storage), or ORBC (>14 days storage). StO₂ will be measured using a noninvasive near-infrared spectroscopy probe to determine whether ORBC causes a decrease in StO₂ compared to YRBC and FRBC. Additionally, mediators of the storage lesion, inflammatory parameters, and clinical outcomes will be evaluated and compared between the three groups and correlated with changes in tissue perfusion. This study will be completed in 2 yr.

1530 Women's Health and Illness Behaviors in the Deployed Setting
59 CSPG/SGVUS
Lt Col Candy Wilson

Military women are regularly deployed to austere settings for war and humanitarian missions. The deployed population consists of 10% women. Women's sex-specific health care needs pose a special challenge for women and health care providers in an austere or ship setting where anonymity cannot be guaranteed, self-

care supplies are limited, and health care professionals' lack confidence to care for private gynecological concerns. The purpose of this study was to gain a better understanding of the illness behaviors of deployed military women in regards to their genitourinary (GU) health. Ethnography was used to explore and analyze the data because the military has been described as its own culture. The sample consisted of 43 military women from the US Army, Air Force, and Navy who were either deployed or had been deployed within the past year. The researchers uncovered three themes, which included (1) The Sphere of Control, (2) The Dynamics of Trust, and (3) Life in a Deployed Setting. This study is significant to nursing research because it exposes the influence of culture on GU symptom management. Recommendations from this investigation include: (1) a need for better incremental, pre deployment and in theater education for women and medics; (2) informing leaders about the need to ensure the supply of self-care treatments and women's feminine hygiene products are available; and (3) promoting the role of family support stateside as a resource for information, supplies, and emotional support. This study was funded by the TriService Nursing Research Program (N08-P03).



Force Health Protection Track

ABSTRACTS

Tuesday, 2 August 2011

**1300 Air Emissions Characterization and Geospatial Exposure Modeling from Open Burning of Representative Military Deployed Waste
AF Institute of Technology
Lt Col Dirk Yamamoto**

Open burning of US military waste while deployed has attracted considerable attention over recent years due to reported health problems among returning military members. In conjunction with the rest of DoD, the US Air Force has conducted considerable sampling and risk assessment at deployed sites. At the Air Force Institute of Technology (Wright-Patterson AFB, OH), recent research has focused on building a retrospective plume dispersion modeling tool for particulate matter exposures, to better characterize the risk profile for deployed members. This approach may provide more realistic exposure estimates, versus assigning a single exposure value for an entire population. Ongoing research, sponsored by AF Surgeon General and performed in conjunction with the US Environmental Protection Agency, will first determine emission factors and likely concentrations of key contaminants by performing small-scale laboratory burns, with subsequent large-scale outdoor burns to evaluate the effectiveness of air curtain burners as an alternative to open/surface burns. A primary objective of the research is to address the question on whether segregation of plastics makes a significant difference in emissions from open- and air curtain burning. A secondary objective is to further develop the software plume dispersion modeling tool to better predict downwind risk to personnel near burn sites. This presentation provides a status update of the ongoing research at the Air Force Institute of Technology.

**1330 Inhalation Exposure to JP-8 Jet Fuel Enhances Susceptibility to Noise Induced Hearing Loss in Rats
711 HPW/RHPBA
Dr. David Mattie**

Studies identified organic solvents as potential ototoxicants promoting noise-induced hearing loss (NIHL). The ability of JP-8 to enhance susceptibility to noise exposure on auditory function was studied in rats. An initial study exposed rats to 0, 75, 85 or 95 dB octave band noise for 6 hours per day, 5 days per week over 4 weeks. Hearing loss was assessed using distortion product otoacoustic emission (DPOAE) to evaluate outer hair cell function and compound action potential (CAP) to determine hearing threshold. Histopathology of cochleas was conducted to determine percentage of hair cell loss. Noise exposure of 85 dB was identified as the LOAEL and was used in the second study to investigate combined effects of JP-8 and noise on hearing by exposing rats to 85 dB and either 0, 200, 750 or 1500 mg/m³ JP-8 for 6 h per day, 5 days per week over 4 weeks. DPOAE, CAP and histopathology of the cochlea for rats exposed to noise and JP-8 showed a dose response increase in hearing loss greater than seen with just 85 dB alone. A third study with just JP-8 alone resulted in no hearing loss indicating JP-8 only potentiates NIHL. A fourth 28-day study consisted of exposures at 102 dB for 15 min per hr for 6 hrs per day, 1000 mg/m³ JP-8 for 6 hr/day, combined exposure to both noise and JP-8, and no experimental treatment. Auditory testing again showed JP-8 by itself didn't produce hearing impairment but male rats were affected more than females.

**1400 Assessing Operationally Relevant Aspects of Nanoparticle Exposure Health Risks
711 HPW/USAFSAM-PHT
Dr. Clarise Starr**

There is little known in the scientific literature regarding the potential dangers and downstream sequelae caused

by exposure to nanoparticles. This lack of information has led to conjecture about the potential uses and dangers associated with this new technology, including the possibility that nanoparticles could be used as a weapon to target the warfighter. The purpose of this effort is to answer basic, previously untested parameters regarding nanomaterials to assess the relevance to the potential exposure (from both modified and unmodified nanomaterials) in the field. Three commercial grade nanoparticles--ZnO, TiO₂, and CeO₂, were studied for personal protective equipment (PPE) efficiency, initial uptake by cell lines, and downstream cytotoxic effects. Preliminary data suggest PPE provided good barriers against nanoparticle exposure. Initial exposure to nanoparticles (2 hr) showed an interaction with the cells, but uptake of the nanoparticles varied depending on cell line. The nanoparticles that were found to be cytotoxic had a longer exposure to the cell lines, indicating that long-term exposure may be key to overall health risks.

Distribution Statement A: Approved for public release; distribution is unlimited. Case Number: 88ABW-2011-2292, 18 Apr 2011.

1445 Transport of Silver Nanoparticles in Saturated Porous Media: Experimental Results and Model Simulations

AFIT/ENV

Capt Jason Flory

Nanosilver is the largest and fastest growing category of nanomaterial, with extensive USAF and DoD applications. A growing number of studies show that nanosilver may pose significant adverse human and environmental effects. Given the ubiquity of nanosilver and its potential toxicity, it is incumbent upon us to understand its environmental fate and transport. Due to the importance of groundwater as a pathway from contamination sources to human and environmental receptors, this study examined how nanosilver is transported in saturated porous media. In the study, silver nanoparticles (AgNPs) were synthesized in the laboratory using a sodium borohydride reduction method. The transport of these nanoparticles in a saturated porous media packed column was investigated. Both a conservative tracer and AgNPs were injected into water flowing through the laboratory column (diameter: 2.5 cm, length: 15 cm) packed with water-saturated quartz sand to obtain concentration-versus-time breakthrough curves. The AgNPs were found to break through before the conservative tracer, perhaps due to the facilitated transport of AgNPs (i.e., AgNPs moved through larger pores, and therefore moved faster than the tracer). It was also observed that the total mass of AgNPs leaving the column was smaller than the total input mass, indicating the capture of a fraction of the

colloidal AgNPs by the porous media. Filtration theory was used to simulate the transport behavior of the AgNPs in the quartz sand packed column.

1515 Evaluation of Gold Nanomaterial Toxicity Based on Physical and Chemical Properties

711HPW/RHPBA

Dr. Saber Hussain

Gold nanomaterials (Au NMs) have distinctive electronic and optical properties, making them ideal candidates for biological, medical and defense applications. Therefore, it is important to evaluate the potential biological impact of Au NMs before employing them in any application. In the present study, we investigated whether the size, charge and shape of the Au NMs plays a role in mediating a biological response in an in vitro model of human skin cells. The results demonstrated that smaller 0.8nm and 1.5nm Au NP's were toxic in a concentration dependent manner, regardless of charge. However, gene expression studies showed that the 1.5nm Au NPs induced DNA damage and down-regulated the DNA repair mechanism with these genes varying based on charge. Further, the results have illustrated that the gold nanorods (17nm AuNR-PEG (AR=2.1)) were cytotoxic to the skin cells, while the gold nanospheres (20nm AuNS-MPS) were not toxic even at the highest dose of 100 µg/ml. Additionally, exposure to the 17nm AuNR-PEG (AR=2.1) caused the formation of significant amounts of ROS, and the up-regulation of several genes involved in cellular stress and toxicity. In summary, these results indicated that size, surface charge, and shape play a key role in mediating the cellular response to Au NMs.

1545 Nanomaterial Hazard Identification: The Zebrafish Model for Rapid Material Testing

349th Medical Squadron (349 MDS)

Maj Joseph Fisher

Force Health Protection is facing a new challenge both in-garrison and in deployed operations as the nanotechnology revolution begins. The National Science Foundation predicts the period from 2011-2020 will result in fundamentally new products based on nanomaterials. These chemical biophysical nanometer scale (i.e., 1 x 10⁻⁹ meters) materials may bring new or increased hazard to humans and the environment, and the uncertainty surrounding their risk to biological and environmental health needs to be investigated. Health

risk can be defined as a function of hazard and exposure, and an understanding of the hazard and exposure of these materials is important in order to minimize health risk. Products utilizing nanoscale materials will become ubiquitous throughout commerce in the coming years and regulatory oversight and reporting in the EU and the US is moving forward. The development of the zebrafish (*Danio rerio*) model for rapid material testing bridges a gap in toxicology testing between in vitro cell culture models and in vivo mammalian models. The anatomy, physiology, and genomics of the zebrafish are highly homologous to humans, and these similarities are just beginning to be exploited by research communities. Being a whole animal vertebrate organism, zebrafish allow for great flexibility in conducting experimental assays to identify nanomaterial exposure effects in morphology, physiology, behavior, and distribution. This research presents an overview of the issues surrounding nanomaterial health risk and provides testing results in order to demonstrate the utility of the zebrafish model in answering nanomaterial bio-compatibility research questions.

Wednesday, 3 August 2011

0800 USAF Efficient Running : An Integrated Program To Reduce Running Injury and Improve Individual Performance in USAF Fitness Assessment
AFMSA/SG6
Lt Col Antonio Eppolito

Running is an essential duty in the USAF "Fit to Fight" culture. Its importance is more critical now as the USAF Fitness Assessment (FA) will have more emphasis on the aerobic component, now 60% of the score, and more frequent testing. Because of this mandate (ref. AFI 36-2905), running has risen to the #2 cause of recreational injuries in the USAF (ref. Descriptive Epidemiology USAF Lost Workday Injuries 2008 report). The annual FA failure rate has doubled from 10% to 20% with the new PFT standards. (As high as 28% at some bases) And yet, the USAF lacks an evidence and experience based program specifically for running which is clear, simple, and understandable and can be incorporated into standardized training for all troops. There are huge direct costs to the military for running injuries and poor FA performances: (1) Medical and Physical Therapy treatment of injuries (clinic visits, MRI's, x-rays, therapy, etc) with a resultant backlog of sports medicine orthopedic referrals of up to 6 months at many MTFs (2) Cost of compensation to AD, ANG and USAFR members who are "injured" while running during duty

time and cannot perform their job (3) Costs of command directed programs for retraining annual FA failures and wasted administrative time for retesting, profiles, and waivers (4) Missed work time due to injuries and appointments (5) Needless generation of preventable MEBs. There are also indirect costs which may be even greater: (1) Early separation due to low FA performance scores and failures (2) Decreased productivity due to lack of fitness and overall good health (concept of presenteeism) (3) Deteriorating morale (4) Permanent disability. Injury-free daily aerobic activity supports optimal physical wellness, mental clarity, weight management, and reduces health care utilization. Evidence-based training tools are applied to almost all skills of such importance and most athletic activities except for running. Furthermore, where they are applied most methods are traditional, inefficient, and not standardized. The 2008 USAF Lost Workdays Report highlights the emergence of running injuries and recommends immediate implementation of preventive strategies to address all aspects of running including; injury prevention countermeasures, volume of training, focused lower extremity strengthening and flexibility, proper gait technique and proper footwear. "Efficient Running" is in direct alignment with all the corrective strategies outlined in the critical report and provides the countermeasures. Efficient Running then is our proposed solution. It is based on the biomechanical principles of the most revolutionary concept in the arena of sports medicine in 40 years. It addresses injury prevention and performance improvement and is grounded in scientific principle and extensive real world experience of over 15 years. Efficient Running is a set of training tools to prevent injury and improve efficiency/performance. Our approach involves teaching and tailoring aerobic principles, putting the body in proper alignment, improving running gait biomechanics, and supplementing with essential core strength, balance and dynamic stability exercises.

0830 Comparison of the 1.5 Mile Run Times at 7,200 Feet and Simulated 850 Feet in a Hyperoxic Room
HQ USAFA/ADPH
Lt Col Michael Zupan

The 1.5-mile run test was developed by Dr. Ken Cooper as an easy, inexpensive, and relatively accurate way to estimate VO2 max, or aerobic fitness levels, in large groups of AF personnel. In 2004 the AF fitness program began using the 1.5-mile run to estimate an airman's aerobic capacity. An altitude adjustment was implemented in 2005 for airmen stationed above 5,000 ft. In 2010, a new AF fitness test program was implemented; however, the 1.5-mile altitude adjustment

for moderate altitude AF bases was removed. This study was conducted to investigate if a significant difference in aerobic performance exists between moderate altitude and sea level and, if it does exist, to what extent. The study was reviewed and approved by the USAFA IRB with all subjects signing an ICD. Fifty-five, 38 male and 17 female, subjects participated in the study. Subjects completed a VO₂max test followed by two 1.5-mile runs, one at 7,200 ft, and one at simulated 850ft (~26% O₂). During the runs, subjects only were aware of their test distance and could adjust the treadmill speed based on how they were feeling. Treadmill speed, elapsed test time, heart rate, and testing environment were unknown during all runs. Results were analyzed using an ANOVA. The average max VO₂ was 48.6 mL.kg.⁻¹min.⁻¹. A 30.6 seconds, or 4.2%, significant difference (p<.001) was observed between the two runs. These differences were mainly due to a decreased hemoglobin oxygen saturation (p<.001). Our recommendation is that an altitude adjustment for the AFT be reinstated.

0900 Can a 10-minute Warm-up Reduce Musculoskeletal Injury in Air Force Academy Cadets?
Uniformed Services University, Injury Prevention Research Lab
Dr. Sarah De La Motte

Musculoskeletal injury (MSK-I) is the leading cause of lost duty time and morbidity in the military. The short and long-term consequences from MSK-I can be career-threatening, if not career-ending, and decrease force readiness. New data show major risk factors for MSK-I in athletic populations can be easily identified and are readily modifiable through prevention programs targeting poor movement patterns. However, maximal MSK-I prevention program design & effectiveness in military environments have not been determined. We are working with the US Air Force Academy (USAFA) Department of Physical Education (DPE) to study the effects of a 10-minute neuromuscular warm-up program performed in required physical training sessions. Sections of a required freshman P.E. class will be randomized to perform a neuromuscular warm-up developed to address previously identified MSK-I risk factors, or a traditional warm-up program. Neuromuscular warm-up sessions will be professionally supervised, with cadets receiving real-time feedback on program performance, including technique & correction cues. Rates of lower extremity injury and biomechanical changes in movement pattern will be compared between groups. Post-training jump-landing assessment data will be compared with pre-training data to determine the neuromuscular warm-up program's effect on "high-risk" movement patterns and coupled with MSK-I incidence

to determine program effectiveness. Pre and post-data will also be compared with subsequent testing sessions in a subsample of cadets to determine washout of training effect and optimum periodicity of warm-up training. This research will provide feasibility and injury incidence data for a larger definitive trial of MSK-I focused prevention programs in the Air Force.

0945 Anti-retinal Antibodies as Biomarkers for Laser Induced Retinal Injuries in Rabbits
Summa Health System
Dr. Rachida Bouhenni

PURPOSE: Retinal injuries affecting the photoreceptors and/or the retinal pigment epithelium (RPE) may result in leakage of retinal-specific proteins into the systemic circulation. These proteins could be detected in body fluids following the injury and vary with the severity of the injury and during the subsequent recovery period.

METHODS: Using a continuous 532 nm laser, 50 spots of mild (MVL), moderate (GII), or severe (GIII) laser lesions were created in retinas of Dutch Belted rabbits (n=12/grade). Serum and saliva were collected from treated and control animals at 1hrs, 4hrs and 24hrs following laser treatment. Retinal-specific proteins were detected using Liquid Chromatography/Tandem Mass spectrometry. Statistical analyses were performed using One way ANOVA. P<0.05 was considered significant.

RESULTS: Retinal-specific proteins were detected in both saliva and serum samples at all time points after laser injury. Most proteins were detected in the samples treated with MVL at 4hrs, followed by GII and GIII laser lesions. Some of the proteins were common to more than one laser grade. Although, more proteins were detected following treatment with mild lesions, and at 4 hrs after treatment, the differences between groups were not significant. **CONCLUSION:** Retinal-specific proteins were detected in both saliva and serum of rabbits following laser treatment. The numbers of proteins detected did not vary with severity and time following injury. The biomarker response appears transient, peaks at 4 hours after laser treatment and is reduced at 24hrs. These proteins could be used as biomarkers for laser induced retinal injuries in military operations.

1015 Detection of Retinal Proteins in Saliva and Serum in Laser Induced Retinal Injuries in Rabbits
Summa Health System
Dr. Rachida Bouhenni

PURPOSE: Retinal injuries that affect the photoreceptors and/or the retinal pigment epithelium (RPE) may result in the leakage of retinal-specific proteins into the systemic circulation. This study was designed to determine whether an immune response is elicited after an acute retinal injury resulting in circulating anti-retinal antibodies in the serum.

METHODS: Fifty laser burns of different grades (minimally visible lesion (MVL), grade II (GII), or grade III (GIII) lesions) were created in the retinas of Dutch Belted rabbits. The degree of laser burns was confirmed by fundus imaging and histology. Serum samples were collected from the animals three months after the retinal injury. Candidate autoantigens were identified by two-dimensional western blots of rabbit retinal lysate probed with sera from either control or laser-treated animals. Candidate autoantigens were further characterized by immunohistochemistry to confirm their retinal localization. **RESULTS:** Seven and eleven protein spots were selected from the MVL and grade II laser-treated samples, respectively, for autoantigen identification. No protein spots were detected in the grade III laser-treated samples. Four candidate autoantigens were common to both MVL and GII lesions: Dihydropyrimidinase-related protein-2, fructose-bisphosphate aldolase C, chaperonin-containing T-complex polypeptide 1 subunit zeta, and pyruvate kinase isozyme. **CONCLUSION:** Induced retinal laser injuries resulted in circulating anti-retinal antibodies that were detectable three months after the injury. The response appeared to vary with the severity of the laser retinal damage. The identification of the candidate antigens in this study suggest that this approach may permit future development of new diagnostic methods for acute retinal injuries.

1045 Serum Biomarker Responses in a Non-Human Primate Model of Acute Retinal Laser Injury **Summa Health System** **Mr. Jeffrey Dunmire**

PURPOSE: To identify unique proteomic signatures in sera indicative of retinal injury. **METHODS:** We used laser photocoagulation as a model of retinal injury in Rhesus macaques. Serum was collected from each animal at 4h, 1d, 3d, and 1w following a mock procedure and again following retinal laser treatment that produced either Grade 2 (moderately severe; GII, n=6) or minimally visible lesions (mild; MVL, n=6). Samples were analyzed by mass spectrometry and relative protein abundances were determined by spectral counting. Stringent filtering criteria and analysis by G-test, followed by Holm-Sidak correction for multiple comparisons, were used to determine statistical significance. Proteins with $p < 0.05$ were considered

significant. **RESULTS:** A total of 19 and 17 proteins were identified as significantly more abundant in sera following MVL and GII injury respectively. None of these proteins were common to both MVL and GII. However, among the 36 proteins, irrespective of injury severity, most were ontologically similar. Although most differences were unique to one time point, 4 proteins (CK18, PGK1, FUT3, and EPHA2) from MVL and 1 protein (DDX17) from GII showed differences at multiple time points after injury. For these proteins, maximal protein elevation between 4h and 3d was followed by a decrease to basal levels within 1w.

CONCLUSIONS: A serum biomarker response to both GII and MVL retinal injury was demonstrated. The proteomic signature was unique for each grade of injury and appeared transiently between 1-3d. Increased abundance of these proteins in serum may be useful markers for detection of acute retinal injury.

1245 Sensors for Monitoring Laser Radiation Exposure Sensing Strategies, Inc **Dr. Richard Preston**

In response to the growing use of lasers in military applications, AF/SGR has developed novel laser sensors to detect and characterize laser radiation exposures. The sensors can be used for occupational health purposes in domestic testing or for force protection in tactical applications. Two types of laser sensors have been fabricated and tested. The first is called the Personnel Protection Sensor (PPS) which is designed to detect pulsed lasers in the 400-1100 nm spectral range. The sensor provides live feedback regarding the exposure levels and indicates if protective eye wear will be effective in preventing injury. The PPS is battery operated and can be run for up to seven hours to log exposures during domestic testing or in ground or flight operations in tactical engagements. The second type of sensor is called the Geolocation Sensor and it characterizes both pulsed and CW lasers. This sensor provides more detailed data on the laser radiation and explicitly measures wavelength and angle of arrival. The Geolocation Sensor is larger in size than the PPS and requires external power to operate. This talk will describe the sensors and present sample test data. AF/SGR welcomes organizations interested in borrowing the hardware for new test applications. AF/SGR will provide test planning consultation with potential users and provide subject matter experts to assist in data analysis if needed.

1315 Gene Expression Profile of Jurkat Cells Exposed to High-Power Terahertz Radiation

711 HPW/RHDR

1Lt Jessica Grundt

Terahertz (THz) radiation sources are now being used in a various military, defense, and medical applications. Widespread employment of these new applications has prompted concerns regarding the potential health effects associated with THz radiation. A source for these concerns stems from results of recent studies which provide evidence that THz radiation can couple directly to biological macromolecules (lipids, DNA, proteins) causing localized effects affecting gene transcriptional processes. In this work, we hypothesized that if THz radiation does cause direct damage to biological macromolecules, then THz-exposed cells may express a specific gene expression profile indicative of this unique damage. To test this hypothesis, Jurkat cells were irradiated with a molecular gas THz laser (2.52 THz, 636 mWcm⁻², durations: 5, 10, 20, 30, 40, or 50 min). Cellular viability was assessed 24 h post-exposure using conventional MTT assays, and gene expression profiles were evaluated 4 h post-exposure using mRNA microarrays gene chips. Comparable analyses were also performed for hyperthermic (bulk heated) positive controls (44°C for 40 min). We found that many of the genes that were upregulated in the THz-exposed samples were also expressed in the thermal controls; however, several genes were only expressed in the THz exposure group. Interestingly, these target genes are known to function in the regulation of cellular proliferation, membrane repair, and transcriptional processes. These results suggest that THz radiation may couple to biological macromolecules resulting in direct effects, which do not appear to be fully attributable the temperature rise generated during exposures (i.e. conventional thermal effects).

1345 Department of Defense Biological Threat Responses to the 2009-2010 H1N1 Influenza Outbreak

AF/A5XP

Ms. Calli Levin

Beginning in April 2009 with the outbreak and rapid spread of the H1N1 “swine flu,” the world witnessed the potential effects of a bioterrorist attack. While the 2009-2010 H1N1 pandemic was a naturally-occurring disease outbreak and not a deliberate attack, the symptoms, infection rates and response mechanisms associated with the virus could be similar to the impacts of a deliberate biological agent attack. Unlike nuclear or chemical weapons that have clearly identifiable signatures,

biological agents may be disseminated covertly, and therefore they may not be identified immediately. The first indication of a biological event could be more numerous-than-expected hospital visits in a particular location (e.g. a military installation), or in a group of people who were in the same location at the same time (e.g. basic combat training). Force health protection planners will be better positioned to respond to future biological events using experience gained during the H1N1 pandemic. It provided the Department of Defense an opportunity to exercise disease containment planning measures and address biological warfare response mechanisms. Seventy-five percent of H1N1 infections worldwide involved those under 30 years of age—a significant statistic for the DoD as more than 66 percent of active duty military personnel are within that age bracket. The H1N1 outbreak prompted the DoD to implement a range of force health protection measures, focusing on social distancing efforts called for in USNORTHCOM CONPLAN 3551, and on vaccination campaigns. This presentation will address the protective measures implemented by the DoD and will present key lessons learned.

1430 Expanding Surge Capacity in Airborne Isolation & Worker Protection During Bioterrorism & Epidemic Response

U.S. Public Health Service

CDC - NIOSH

CAPT Kenneth Mead

Shortages in airborne infection isolation capacity are well documented within the U.S. healthcare system. During an airborne infectious epidemic, non-traditional healthcare environments such as field medical shelters, social service facilities, nursing homes, and quarantine stations, could also require emergency airborne isolation capacity. An affordable method for expedient airborne infection isolation is required to meet emergency surge requirements. The research discussed in this presentation began as an investigation of expedient methods to establish airborne infection isolation within conventional, non-isolation hospital rooms using portable filtration units and common hardware supplies. The research focused enhanced scrutiny on concentration reduction and worker protection, rather than focusing solely upon containment strategies. For the field studies, two airborne isolation configurations were evaluated within each of four Midwestern hospitals. Results revealed the expedient airborne isolation configurations were successful at airborne containment while also providing significant reductions in potential worker exposures. Concentration reduction ratios were 98-99 percent or greater, resulting in workplace protection factors several times greater than that assigned

for N95 respirators. Subsequent research has expanded the concepts to medical shelters and other alternative-care environments and has begun to investigate adaptations for ambulance interiors. One application even operates off-the-grid in austere environments. The ability to keep response workers healthy should be a paramount consideration when managing an emergency response operation. When combined with the requirement for isolating infectious patients to avoid further disease propagation, the findings of this research effort could have important implications upon U.S. healthcare emergency planning policies.

1500 Update on Lab validation of new bioagent ID system: FilmArray 60 MDG
Maj Carlos Maldonado

In accordance with current (SGROCC #10000040) AFMS needs for advanced molecular diagnostic capabilities against infectious disease agents, the Clinical Investigation Facility (CIF) at Travis AFB, is participating in a multi-center, limited laboratory validation (LLV) to assess both the utility and reliability of a new PCR platform in a variety of military settings. Idaho Technology's FilmArray system is a small (bread box-sized) PCR-based instrument capable of simultaneously detecting multiple biological agents from a single clinical sample. This novel multiplex system also incorporates an initial sample purification step within the instrument eliminating the need for other equipment and a separate facility. The system's sample-to-answer turnaround time is approximately 1.25 hrs, which is a significant improvement over the 3-4 hours it takes for the currently fielded JBAIDS system. This study is sponsored by the AFMSA Research and Development Innovations (AFMSA/ SG9) office and Idaho Technology Inc. Learning Objectives:

Objective 1. List the current force health protection requirements of different MAJCOMs.

Objective 2. Discuss how the 43T clinical R&D is working to meet those force health protection requirements.

Objective 3. Discuss the advantages, limitations and mitigation strategies of molecular-based diagnostics.

1530 Next-Generation Sequencing Technology for Disease Detection
711 HPW/USAFSAM-PHT
Dr. James Baldwin

Polymerase chain reaction (PCR) is a highly efficient method of pathogen detection; however, most PCR-based assays are unable to provide deeply multiplexed detections (25 or more). Furthermore, such tests need foreknowledge such as primers/probes in a PCR reaction. As a consequence, PCR tests are limited to a small number of potential known microbial targets and are not suitable for the detection of unexpected or newly emergent pathogens. We have demonstrated that methods such as degenerate PCR may be employed to detect larger selections of organisms, such as newly emergent threats, where exact primers are unknown. However, with increase in scope comes a greatly increased burden on the detection technology in the form of potentially numerous detections (deeply multiplexed) per sample. To meet the larger goal of detecting wide ranges of organisms in a manner suitable for clinical and environmental surveillance against biological threats, future assays will require enhanced equipment and software. The solution is next-generation sequencing technology. These devices can read many thousands to millions of parallel sequences in a single run (sample). Furthermore, they can produce exact sequences that are far more precise for identifying microorganisms than PCR alone. Recent advances could allow such platforms to approach the cost envelope of conventional PCR testing. Assays based on next-generation sequencing can provide the capability to detect rapidly emerging infections in deployed forces. A mature test in such a platform would offer a massive boost to the pathogen identification capabilities commonly available in the Air Force. Distribution Statement A: Approved for public release; distribution is unlimited. Case Number: 8ABW-2011-2230, 14 Apr 2011.



TBI and Psychological Health Track

ABSTRACTS

Tuesday, 2 August 2011

1300 (Pro) Decompressive Craniectomy: Lessons Learned and Clinical Experience from the DECRA Study and US Combat Operations
US Army Medical Research and Materiel Command
Dr. Kenneth Curley

The recent publication of the DECRA (Decompressive Craniectomy or DC) trial has resulted in a great deal of discussion and disagreement especially within the military neurosurgical community.¹⁻⁴ The trial was an international effort sponsored and coordinated by the Australian and New Zealand Intensive Care Society Clinical Trials Group. It was a prospective, randomized trial involving 155 adults (out of 3478 screened) with severe TBI and medically refractory Intracranial Hypertension (ICH) that found that decompressive craniectomy did not improve functional outcomes at 6 months after injury when compared to a group randomly assigned to receive non-surgical second tier ICP therapy. Col McCafferty(b) and Dr. Marion(c) will opine that many aspects of the trial make this one of the most important recent clinical trials of a novel therapy for severe TBI, and a Class I study that should be considered as the foundation for an evidence-based guideline. The most important is that this was a very well planned, carefully crafted and closely monitored multi-center prospective randomized clinical trial (PRCT), and PRCTs are the gold-standard for evidence based guidelines. By design, the study addressed all 22 elements of the CONSORT guidelines.⁵ Detailed protocols for critical care of all patients were clearly defined, agreed upon by all study investigators, and implemented at all enrolling centers. In particular, all patients were required to have intracranial pressure (ICP) monitors, 20 mm Hg was defined as the treatment threshold, and first and second tier ICP therapies were clearly defined. A pilot randomized trial was completed and published in 2008 as the basis for fine tuning protocols and data analysis plans, as well as providing objective data for determining the number of subjects

needed to reach a two-sided type I error of 0.05 for the Phase III trial.⁶ Other than the imbalance in pupil reactivity, there were no significant clinical or demographic differences between the two groups. Dr. Marion and Col McCafferty will also address some of the concerns raised by their colleagues to include the issue of timing and inclusion of “lifesaving” procedure patients who had uncontrolled ICP at 72 hours as well as results of other PRCTs and reports that point to the issue of DC being more “gray” than “black and white”.^{7,8}

1330 (Con) Decompressive Craniectomy: Lessons Learned and Clinical Experience from the DECRA Study and US Combat Operations
Dr. Kenneth Curley

The recent publication of the DECRA (Decompressive Craniectomy or DC) trial has resulted in a great deal of discussion and disagreement especially within the military neurosurgical community.¹ The trial was an international effort sponsored and coordinated by the Australian and New Zealand Intensive Care Society Clinical Trials Group. It was a prospective, randomized trial involving 155 adults (out of 3478 screened) with severe TBI and medically refractory Intracranial Hypertension (ICH) that found that decompressive craniectomy did not improve functional outcomes at 6 months after injury when compared to a group randomly assigned to receive non-surgical second tier ICP therapy. Issues related to severity of injury, timing of intervention, duration of followup and differences between the operated and non-operated groups with respect to injury severity were just a few of the weaknesses identified in the study.² Of concern, many in the neurosurgical and neurological critical care communities have taken this study as evidence to support discontinuing the practice of early DC. This, despite the fact that literature published by military and civilian neurosurgeons in the U.S. have shown significant benefit in the young, healthy population. In one study 60% of the casualties were functioning independently at long-term followup.³⁻⁶ In this session, COL Rocco Armonda (b) and Dr. Bizhan Aarabi (c) will

discuss their experiences regarding DC in contrast to what was revealed by the DECRA trial. They will argue that there is a place for DC in the military and civilian neurocasualty and that the broad interpretation of the conclusions of the DECRA trial are inappropriate.

1400 Treatment with Ethanol Decreases Systemic Inflammation and Improves Functional Recovery After Traumatic Brain Injury in Mice

711 HPW/USAFSAM-ETS

Dr. Timothy Pritts

INTRODUCTION: Traumatic brain injury (TBI) is a major cause of morbidity and mortality in both military and civilian casualties. Clinical studies have suggested that moderate intoxication at the time of head injury is correlated with improved outcome. Previous studies indicate that ethanol attenuates the neuroinflammatory response to traumatic brain injury in mice and may decrease secondary brain injury. We hypothesized that ethanol given after traumatic brain injury would attenuate the neuroinflammatory response and improve functional outcome. **METHODS:** Mice were subjected to a moderately severe blunt TBI by weight drop or sham injury. At 30 min post injury, mice were given 5 g/kg of ethanol or water by gavage. Serum and brain samples were analyzed for inflammatory cytokines by ELISA. Neuron-specific enolase (NSE) was measured as a serum biomarker of TBI severity. Functional recovery was tested on the rotarod device at intervals up to 2 weeks post injury. **RESULTS:** In mice receiving ethanol, there were decreased serum levels of KC (145.1 vs. 317.2 pg/mL; $p < 0.05$) and IL-6 (57.6 vs. 230.2 pg/mL; $p < 0.05$) 3 hr after TBI as compared to those mice receiving vehicle. Serum levels of NSE were diminished in mice receiving ethanol as compared to water (65.6 vs. 164 μ g/L; $p < 0.05$). Functional recovery, as measured rotarod time, was improved at 3 days after injury in mice receiving ethanol as compared to water (99.7% vs. 36.6%; $p < 0.05$). **CONCLUSION:** After moderate TBI, ethanol decreases systemic inflammation, NSE, and results in improved functional outcome as measured by the rotarod device.

1445 Impacts of Frequent and Multiple Deployments on Substance Abuse by Service Members

TMA/DCOE

Dr. Vladimir Nacev

As troops return from Iraq and Afghanistan to civilian life, clinicians and policy decision-makers are grappling

with how best to address the post-deployment adjustment problems. Data suggest the presence of mental health problems for service members that include posttraumatic stress disorder (PTSD), head injury, interpersonal violence, and substance abuse. Moderate correlations were found between PTSD symptoms severity, substance use, and adverse health outcomes. Regarding substance abuse, problems with alcohol and nicotine abuse are most prevalent and pose a significant risk to the health of veterans as well as the troops in the Reserve Component and National Guard. At greatest risk are deployed personnel with combat exposures, as they are more apt to engage in new-onset of heavy weekly drinking and binge drinking and to suffer alcohol-related problems as well as smoking initiation and relapse. A maximally effective substance abuse prevention program will require layering of interventions across various environments at the DOD/ Services level, installations level, and service members' level. Prevention efforts for heavy alcohol use are likely to be the most productive if they focus on lower- and midgrade enlisted personnel, as the rate for heavy drinkers was nearly twice as high for personnel in the lower pay grades than the higher. Specifically, among young adults, social motives appear to be associated with moderate alcohol use, enhancement with heavy drinking, and coping motives with alcohol-related problems.

1515 Spouse Abuse and Combat-Related Deployments in Air Force Couples

AFMOA

Maj Rachel Foster

PURPOSE: Despite the general belief that combat-related deployment is associated with increased spousal aggression, evidence showing a link between spouse abuse and deployment is weak. The purpose of this study was to conduct the first population-based investigation comparing rates of spouse abuse among married active duty Air Force (AF) personnel and their spouses after versus before combat-related deployment.

Methods: The sample included all married AF members with at least one substantiated incident of spousal physical or emotional abuse and at least one combat-related deployment between October 1, 2001 and October 31, 2008. Department of Defense (DoD) guidelines regarding the mandatory reporting of spouse abuse by active duty members and DoD civilians changed in April of 2006 to include intimate partners. Substantiated cases of intimate partner violence were deleted from this study so as not to conflate intimate partner violence and spouse abuse. During the 85-month study period, 6,063 individuals in 4,874 AF married couples were reported for 7,003 unique incidents of spouse abuse across 9,676,517 days at risk (i.e., days when neither spouse was deployed).

RESULTS: Overall, spouse abuse rates were lower after deployment (RR = .87, CI95%: .84, .91). This general pattern was found regardless of offender military status, type of abuse, total number of deployments, and total deployment duration. However, in some circumstances spouse abuse rates were higher after than before deployment. For example, for couples exhibiting unidirectional abuse (by either spouse) when the offender had used alcohol, post deployment abuse was higher. Further, for couples in which the husband perpetrated unilateral moderate or severe spouse abuse and used alcohol, the abuse rate was 37% higher after as compared to before deployment. **IMPLICATIONS:** Although spouse abuse rates increased following deployment under some conditions, the overall rate was lower after deployment. However, because the present study included only abusive couples who had experienced combat-related deployment, these results do not necessarily reflect changes in rates of spouse abuse in the general AF population during the study period. Notwithstanding, the data suggest that prevention efforts should focus not just on spousal violence but also on context and in particular on the use of alcohol.

1545 The Psychometric Properties and Clinical Utility of the Air Force Post-Deployment Health Reassessment (PDHRA) for Airmen with Posttraumatic Stress Disorder (PTSD) or Depression
AFMSA
Maj Michael McCarthy

Operation Enduring Freedom (OEF) (Afghanistan) and Operation Iraqi Freedom (OIF) represent one of the longest wartime deployments in the history of the American military. To date, more than 2 million American military members have deployed. Of these, an estimated 300,000 have returned with a mental health condition, such as depression or PTSD. The Department of Defense has established a robust screening program to identify and track deployment-related physical and psychiatric illnesses. The Post-Deployment Health Reassessment (PDHRA) is a primary tool to identify physical and psychiatric risk following a deployment. The PDHRA is a web-based survey, which is administered between 90-180 days after a deployment. This study seeks to evaluate the psychometric properties and clinical utility of the Post-Deployment Health Reassessment (PDHRA) for accurately identifying trauma and depression among Airmen following a deployment. Descriptive statistics, confirmatory factor analysis and structural equation modeling were used to address separate research aims. Study aims assessed the impact of deployment on military members and the

clinical utility and psychometric properties of the Post-Deployment Health Reassessment. Findings suggest that the Post-Deployment Health Reassessment is a useful triage tool to identify trauma and depression among Airmen following deployment. The study makes recommendations for improving the clinical utility and psychometric properties of the Post-Deployment Health Reassessment (PDHRA).

Wednesday, 3 August 2011

0800 Trends in the Early Care of Casualties with Polytrauma and Moderate or Severe TBI
USUHS/GSN (USAF/NC)
Lt Col Karen O'Connell

Moderate and severe traumatic brain injuries (TBIs) result in death or significant lifelong deficits. Secondary insults such as hypovolemic hypotension, hypoxia, and hypothermia exacerbate primary TBI. The purpose of this study was to describe the characteristics of casualties with polytrauma and a moderate or severe TBI. Data from the Joint Theater Trauma Registry for casualties with polytrauma/TBI admitted to a Level III facility were studied. All American forces who sustained blunt trauma with a head Abbreviated Injury Score > 2 and an admission Glasgow Coma Scale score ≤ 12 between 2006 and 2010 were included. Descriptive and bivariate statistics were used to determine any trends in admission vital signs, massive transfusion requirements, or mortality during the first 24 hours after injury. Data were available for 239 casualties. Once admitted to a level III facility, survival was 91.2%, similar to overall casualty survival statistics. Hypoxia and hypothermia occurred in less than 6% of casualties. Hyperthermia and hypotension occurred in 15.9% and 14.6% of casualties, respectively. A massive transfusion was required in 17.6% of casualties. There was a significant correlation between Level III admission vital signs and mortality and the administration of a massive transfusion. The results demonstrate the high incidence of hyperthermia and emphasize the need to closely monitor temperature as uncontrolled hyperthermia may contribute to secondary brain injury. The correlations are not unexpected but warrant further examination of the relationships. Casualties with polytrauma/TBI have a high survival rate revealing the need for further secondary insult prevention research to improve outcome.**These are the preliminary results for a study intended to benchmark 24 hour mortality and evaluate the relationships between the level III facility admission vital signs and 24 hour mortality in this population.

“The author acknowledges Joint Theater Trauma Registry (JTTR) for providing data for this study.”

0830 The Traumatic Brain Injury Research Portfolio of the Army and Defense Medical Research and Development Programs: An Overview US Army Medical Research and Materiel Command COL Dallas Hack

The US Army Medical Research and Materiel Command (USAMRMC) has been tasked with the management of Army and Defense Medical Research and Development Program (DMRDP) intra- and extramural projects addressing the diagnosis and treatment of traumatic brain injury (TBI). While these research topics are by no means new to the command, increased funding in response to the significant increase in TBI since the onset of Operations Iraqi Freedom and Enduring Freedom has enabled expansion and expedition of research efforts. As of April 2011 over 450 projects at a cost of over \$400M have been awarded or are pending award. These efforts span epidemiology, diagnostics, monitoring, en-route care, initial and definitive treatment, protection and rehabilitation. This large and complex portfolio will be reviewed with respect to promising results and remaining research gaps according to our Continuum of Care model. The project management process involving three Joint Program Committees and their relevant working groups will be described. The goal is for our partners in our sister services to better understand the scope of the portfolio as well as the joint-service nature and processes of portfolio management.

0900 Update on Non-Invasive TBI Diagnostic Efforts US Army MRMC Dr. Douglas Gibson

In September 2010 BG James J. Carroll, USAF, signed a Capability Development Document (CDD) for a non-invasive traumatic brain injury diagnostic capability. This was the culmination of a procurement effort sponsored by USAF Air Combat Command. The CDD was taken up by Joint Program Committee 6 (JPC6) and in January of 2011 an Integrated Product Team (IPT) was chartered for joint development of a diagnostic device. This presentation will report on progress of that IPT. Included will be descriptions of the leading technologies.

0945 Read out Loud: The Impact of Military Deployments on Shared Reading Practices in Pre-School Children SAUSHEC Capt Gayle Haischer-Rollo

Objective: The impact of a decade of military deployments on the population of military children is largely unknown. Parent-child reading habits during recent deployments may have long reaching impacts into the development of military children. Since September 11th 2001 many military families have experienced long and more frequent deployments. Although there are multiple ongoing studies investigating the psychosocial impact of deployments on families and children; there are few that focus on the important aspect of reading in the home. We decided to study the number of nights per week parents read to their children and compare the rates between military families with no deployed parents and those with one parent deployed. Methods: We distributed a brief questionnaire to 40 deployed and 70 non-deployed families at two similar southwestern military base clinics. Results: We found that parents with a deployed member in the family read to their children on average 4.65 nights a week and non-deployed 5.75 nights per week (p value 0.0059). We also found that families with a deployed member read on average 18 minutes per session as opposed to families with no deployed member reading 28.6 minutes per night (p value 0.0011). Conclusions: Health care professionals taking care of military dependants should be aware of that time spent in shared reading practices may be impacted during deployment. This information can be used when counseling parents and supporting them with resources aimed at increasing household literacy practices.

1015 Potential Burden of Repetitive Concussions in the Pediatric Population 633rd MDOS/SGOMP MAJ Dalila Lewis

Sports injury is the second leading cause of traumatic brain injury in persons aged 15-24 years. Concussions are of particular interest in the pediatric population as the vast majority of persons playing contact or collision sports are under the age of 21 years. Young athletes are more prone to adverse sequelae following concussion according to an ever-growing body of scientific literature. Reasons for this are multiple, and include mechanical, physiologic, and neurometabolic differences of the developing brain. Suboptimal recovery in areas of

attention, verbal memory, visual processing speed, reaction time, numerical sequencing ability, and learning has been observed via standardized computerized testing following concussion in young athletes. Further, post-concussive symptoms of headache, disequilibrium, emotional lability, dysregulated sleep, and cognitive difficulty are frequently prolonged after repeated concussions. Entities such as 'dementia pugilistica' and 'chronic traumatic encephalopathy' in adult athletes have highlighted concern regarding potential cumulative chronic neuropathologic changes that may result from repetitive concussive injury. In addition, current studies involving nuclear imaging to attempt to determine a temporal window of relative cerebral vulnerability following concussion have demonstrated prolonged disturbances in cerebral metabolism following concussive injury. Results of these studies have prompted the recommendation of a period of 'cognitive rest' following concussion ranging from one to several weeks. As persons taking care of both the active duty population and their young dependents, it is imperative that clinicians be aware of the potential impact of concussion, both immediate and long term.

1045 Concussion Research in Children and Youth

DCoE

Col Stephen Sharp

Concussion is receiving increased attention in the military and civilian populations because of the number of Service Members concussed in the Global War on Terror and the reports of long term cognitive issues after multiple concussions in professional sports such as the NFL. Even within the military community data has suggested that approximately 80% of concussion occurs CONUS from sports injuries and falls. Appropriately, increasing concern is being given to the effects of concussion on children and adolescents, particularly those stemming from athletic activities. A result has been an increased research effort looking for better ways to diagnose and assess concussion in young people, more stringent recommendations regarding returning to play, and better methods for treatment. Studies looking at biomarkers, EEG, and neuroimaging that were originally aimed at adults are now being investigated in youth as well. A recent controversial recommendation for cognitive rest after concussion has generated a lot of discussion. What is cognitive rest? Does outward cognitive rest equate to actual physiological brain rest? Are the results significant enough to warrant enforcing this on active young people? Additionally, researchers are looking at the question of the time that the brain is at risk post-concussion. How long should one be "protected" from a subsequent concussion? Should rules be changed for sports in youth that vary even more

significantly from those in adults? The presentation will discuss the present reported research in these areas from screening and diagnosis through treatment and return to activity as they apply to children and youth.

1245 Addressing Sleep Disorders Associated with Mild Traumatic Brain Injury

DCoE

CDR Michael Handrigan

Mild Traumatic Brain Injury is frequently associated with co-occurring sleep disturbances leading to difficulty in recovery, complications with rehabilitation and diminished quality of life. Sleep disturbances in the acute post-TBI period should be an important clinical focus since this is a period of active functional recovery. Identification and treatment of sleep disturbances during this period may reduce TBI morbidity, enhance recovery and limit long term sequelae of mTBI including the risk of chronic sleep disorder. This presentation will focus on the evaluation of sleep disorder following mTBI and treatment tips for sleep based on potential etiology.

1315 The Association of Post-Deployment Symptoms with Concussion and Post-Traumatic Stress Disorder in US Soldiers Deployed to Iraq or Afghanistan

WRAIR

Dr. Richard Herrell

We examined the effects of single and multiple concussions on post-deployment health symptoms in a sample of 2,064 U.S. Soldiers who completed an anonymous survey 4 to 6 months after returning from deployment to Iraq or Afghanistan. 17% of the study participants reported suffering a concussion during their previous deployments. One third reported a head injury with a loss of consciousness (LOC), the remainder an alteration of consciousness (AOC) only. Of those reporting a concussion, 59% reported more than one concussion during their previous deployment. After adjustment for PTSD, depression, and other factors, LOC was significantly associated with headaches, memory problems and balance problems. However, PTSD and depression had a stronger association with these symptoms than concussion history. Multiple occurrences of concussion increased the risk of headache

and sleep disturbances compared to a single occurrence, independent of PTSD or depression. However, even in this group, depression showed equivalent odds ratios for the association with headache and sleep disturbances. These data indicate that current screening tools for mTBI being used by the Department of Defense and Veterans Affairs may have limited utility in identifying individuals who have post-deployment symptoms uniquely attributed to concussions. Accumulating evidence supports the need for multidisciplinary collaborative models of treatment in primary care to address the full spectrum of post-war physical and neurocognitive health problems.

1345 VA Screening and Evaluation Data for TBI: Effects of Psychiatric Symptoms and Injury Characteristics
DCoE / VA Maryland Health Care System
Dr. Alison Cernich

This presentation will summarize findings from a retrospective analysis of traumatic brain injury (TBI) screening and evaluation data from a VA Medical Center in an urban area. Data taken from the initial two years of the program were gathered to determine the effect of concurrent report of psychiatric symptoms on TBI symptom reports, the factor structure of the secondary level symptom questionnaire and the effect of concurrent psychiatric symptoms on the measure, and the effect of injury characteristics and psychiatric symptoms on neurocognitive evaluation. Sample size ranged from approximately 300 Veterans for the screening evaluations to 30 veterans who had data available from a neuropsychological evaluation. Findings from this retrospective review revealed that individuals with positive TBI and positive PTSD initial screens had higher rates of symptom reporting with greater emphasis on cognitive symptom reporting ($\eta^2 = .061-.111$). Screening data for depression accounted for the greater proportion of the variance in TBI symptom reporting, over and above PTSD or reported alcohol abuse. Finally, a smaller study of cognitive testing looked at the effect of PTSD and reported LOC on cognitive testing results. Self-reported LOC had a small effect on processing speed and there was no particular effect of PTSD on anything but symptom reports. Implications of these data for the evaluation of these Veterans and the need for close integration of rehabilitation and mental health services will be discussed.

1430 Crisis planning for suicidal patients in combat zones
University of Texas Health Science Center at San Antonio
Dr. Craig Bryan

The crisis response plan (CRP) is an increasingly common intervention for the management of suicidal individuals across settings that has been transplanted to combat zones and aeromedical evacuation system. However, the effective use of CRPs within these settings can be hindered by contextual limitations. In the current presentation, real-life challenges and practical, evidence-based recommendations for the use of CRPs to maximize effectiveness of suicide risk management within combat zones and the aeromedical evacuation system are discussed.

1500 Trends in service members seeking combat stress services in remote deployed settings
88 MDG - WPAFB
Capt Sara Wright, Ph.D.

The purpose of this presentation is to educate medical providers on trends in service members who seek combat stress services in deployed settings. A descriptive analysis was conducted of military service members who sought combat stress services in Afghanistan from 2008 to 2010 at four forward operating bases and three combat outposts. Prevalence and ratios analyses were conducted to describe demographic information, including age, race, gender, rank, marital status, number of deployments, and history of prior mental health treatment. Information was also collected about treatment including presenting problem, diagnosis, length of treatment, psychiatric medication use, and treatment dropout rates. The demographic information collected in this project was then discussed in the context of demographic information known about SM who were deployed to Afghanistan in similar time frame (MHAT, 2009). The information gathered can be used in several ways to better educate medical and mental health providers and policymakers about current mental health trends in deployed settings. Specifically, the information can be used to determine those who may be more at risk for developing psychological problems while deployed. In addition, the information can be used by combat stress providers to more effectively target outreach efforts to those who are likely to seek combat stress services. The information can also be used to educate combat stress

providers on the types of diagnoses and treatment interventions that are used in deployed setting.

1530 Clinical features of mTBI within days of injury in a combat zone
University of Texas Health Science Center at San Antonio
Dr. Craig Bryan

There is very limited data regarding the impact of mTBI within days of injury, which restricts deployed medical

providers' ability to make optimal decisions. In the current presentation, a series of findings from a forward-deployed TBI Clinic will be reviewed: (1) absence of differences in neuropsychological functioning according to blast vs. nonblast injury mechanism; (2) clinical factors associated with clinicians' decisions to return a service member to duty; (3) variables contributing to posttraumatic headache; (4) and typical patterns of decline in neuropsychological performance on the ANAM following mTBI.



Healthcare Informatics Track

ABSTRACTS

Tuesday, 2 August 2011

**1300 Patient-Centered Precision Care (PC2)
SG9Z
Dr. Ronald Miller**

The Air Force Patient-Centered Precision Care (PC2Z) Program has been established to guide the use of genomic information in clinical decision-making as the field of personalized medicine advances and medical evidence accumulates. Recent advances in genomic technology have suggested that analyses of a patient's genome can provide information on an individual's health, identifying a patient's response to medication or a person's risk of developing disease relative to the average population. In order to fully realize the potential of genomic medicine, further work must be done to demonstrate its clinical utility and to establish an effective infrastructure for the integration of genomics into clinical care. To achieve these goals, the PC2Z Program is composed of four major pillars:

1. Policy: to identify and address the ethical, legal, and social issues associated with the utilization of genomic information in clinic.
2. Research: to longitudinally assess the clinical utility of the genomic information in the delivery of health care. Additionally, de-identified genomic information will be provided to the government and academic partners for use in additional genetic studies aimed at discovering novel disease-gene associations.
3. Informatics: to evaluate methods for the storage, protection, and integration of genomic information into the existing electronic healthcare records.
4. Education: to provide educational resources for medical staff and patients on interpretation and benefits of genomic information in the delivery of health care.

Through the PC2Z program, genomic data will become a valuable resource, informing the efficient and targeted delivery of health care to patients in the future.

**1330 Patient Health Record Implementation at Elmendorf AFB
University of Maryland
Dr. Ritu Agarwal**

We describe early results of a pilot patient health record (PHR) project implemented and deployed at Elmendorf Air Force Base in December 2010. The PHR tool supports entry and management of health information directly by patients, integrates with the patient's clinical record, and supports secure patient-provider messaging. It is a core component of the US Air Force's transition towards a healthcare delivery system that is patient-focused and incorporates principles of the Patient Centered Medical Home. We provide a brief summary of the project from its initial motivation through development and the go-live period. We outline our long-term research goal which is to gather evidence to demonstrate the value of this suite of tools on patients' health outcomes, their empowerment in making health-related decisions, engagement with healthcare, and the efficiency of health services delivery. Finally, we provide early evidence from surveys of users and providers conducted at the launch of the pilot to assess their baseline expectations about the system and insights on effectiveness of change management efforts. 1,639 patients registered during the project's three month baseline period. 283 patients responded to the email survey requests. Approximately half of the providers completed surveys. While it is very early in the implementation of the PHR and available data for analysis is limited, we are able to make a few recommendations based on preliminary findings. Early results indicate an overwhelmingly positive patient response to the PHR tool which is not reflected to the same degree by the providers. Consequently, training and messaging targeted toward providers should be positive but also realistically set expectations. As the PHR is deployed at other MTFs, opportunities to personally promote the PHR via registration desks and directly through providers and staff should be emphasized as findings suggest these mechanisms result in higher positive patient perceptions of and intentions to use the PHR.

1400 AFMS Diabetes Care Quality Measure

AFMSA/SG6H

Ms. Brooke Asbury

Based on HEDIS® scores, some military treatment facilities (MTFs) underperform on selected diabetes care measures compared to national benchmarks and other MTFs. As an exercise in leveraging existing AFMS informatics resources to target patients for care, the Air Force Medical Service (AFMS) Applied Clinical Epidemiology (ACE) team mined AFMS data systems to identify where gaps in diabetes care are occurring as reflected by AFMS performance on several HEDIS® measures. Also, to determine if performance is partially related to patient factors outside of MTF control that could be adjusted for when comparing HEDIS® scores within the AFMS, ACE examined selected characteristics of March 2010 MTF-enrolled, TRICARE Prime and Plus diabetics. Results were further validated using November 2010 data. Only patients with MTF visits in the past year were included in analyses. From multivariate logistic regression, male gender, older age, presence of Primary Care Manager (PCM) visit, and presence of 1+ insulin dispensing event in the past 2 years predicted better glycemic control. Female gender, older age, presence of PCM visit, and absence of dispensed insulin predicted better LDL control. After adjustment by age and gender, two salient patient-level characteristics not under MTF control, differences persisted in MTF adjusted scores for some measures. Though arguably all patients' outcomes should be held to HEDIS® standards, adjustment by age, gender and perhaps other sociodemographic case-mix factors described in literature may allow for fairer comparison of HEDIS® scores for performance-based payment initiatives and other AFMS-internal reporting initiatives.

1445 Effects of COMPASS Workflow on Documentation Quality of Family Medicine Physicians Using the Military Electronic Health Record (AHLTA)

AFMSA/SG6W

Lt Col Charles Motsinger

Electronic medical records are touted to be able to improve the documentation of medical care. To date there are no studies applying a standardized clinical workflow to an electronic medical record. AIMS: To determine if the COMPASS workflow improves the documentation and coding of family physicians using the military's electronic medical record (AHLTA). Method: 189 charts were reviewed retrospectively from two Air

Force family medicine residency sites. Primary outcomes were compliance with Joint Commission (JC) and Health Services Inspection (HSI) requirements for outpatient documentation, relative value units (RVU's) per encounter, coding accuracy, and readability of notes. Results: The COMPASS workflow is associated with a significant increase in compliance with JC and HSI requirements ($P<.05$), a significant increase in RVU's per encounter ($P<.05$), a significant increase in coding accuracy ($P<.05$) and a significant increase in readability of notes ($P<.05$).

1515 Teamwork Factors Affecting Safe Blood Product Administration

60 MDG/SGSE

Maj Jennifer Hatzfeld

BACKGROUND: Blood transfusion errors are a potentially fatal mistake that can occur within the hospital setting and often result from errors in patient identification at the bedside just prior to administration. Transfusion errors are most frequent in smaller facilities and primarily due to administering a correctly labeled unit of blood to the incorrect patient.

Methods: Between March 2009 and August 2009, the simulation center at David Grant Medical Center devised a scenario to test if appropriate patient identifiers were verified prior to administering a unit of packed red blood cells. Thirteen teamwork activities were scored for sixteen different clinical teams.

RESULTS: Of the sixteen simulations, four teams (25%) hung the incorrect blood for the patient in the simulated environment. One teamwork factor (team cross-monitors and gives feedback) was statistically significantly lower for groups that gave the wrong blood ($p=0.03$). Four other items suggested differences between groups, but were not statistically significant because of the limited sample size. These factors included directing responsibility to individual team members ($p=0.13$), engaging the patient in treatment ($p=0.15$), making decisions through collective input ($p=0.13$), and clear goals articulated from the leader ($p=0.11$). There were no differences in the scores from the other teamwork factors ($p=1.0$ for all).

CONCLUSION: The simulation environment provides a valuable avenue to practice and evaluate high-risk activities, such as blood product administration. Additional study is needed to determine if the identified teamwork items are significantly different in a larger sample size and in other high-risk activities.

1545 Analysis of Population-Level and Large-Sample Data

711HPW/USAFSAM-PHR

Dr. Ryan Mayes

Sampling techniques and statistical tests are required to estimate population parameters in the absence of data for a fully enumerated population. However, in the military, it is often the case that data represent either very large samples or entire populations, raising the question of how to appropriately analyze data in each of these scenarios. Regarding the case of large-sample data, a simple solution will be presented and explained. The case of population-level data is more complex; discussion will review why it is inappropriate to simply treat population data as a sample and use sample-based testing. Sample-based techniques are not needed to estimate a parameter if that parameter can be calculated; it is not appropriate to apply these techniques to data for a fully enumerated population. Alternatives to sample-based testing will be presented; hypothesis tests answer the question of whether a difference between a parameter and a sample statistic (or between two statistics) is likely real ("significant") but remain silent on whether the difference is important. When comparing two parameters, any detected difference is real – a hypothesis test would be of no use. Because differences are likely to occur, determining whether a difference is important becomes the predominant task. To evaluate the importance of detected differences, options based on both magnitude and probability will be presented. The magnitude-based option sets a priori differences in effect sizes, while the probability-based option uses a non-sample-based z-test (using the population standard deviation rather than a standard error). Multivariable analyses will also be briefly discussed.

Distribution Statement A: Approved for public release; distribution is unlimited. Case Number: 88ABW-2011-2315, 20 Apr 2011

Wednesday, 3 August 2011

0800 The research maze and the wheels of progress: How the Health Services Data Warehouse will transform the way research is done.

AFMSA / SG6H

Lt Col David Carnahan

There are many challenges inherent in every observational study. In the Military Healthcare System (MHS), one of the biggest is accessing the many TB's of

data that represent the medical care of 9.6 million MHS beneficiaries. The current process requires a clinical analyst to access multiple data sources with non-normalized files, determine relationships between the files, write computer code to establish linkages, which ultimately transforms flat files into analytic datasets needed for analysis. In some cases, to answer the research question appropriately requires multiple individuals to bring together data across different organizations to develop the dataset. This can be a great source of frustration, and a great deal of time spent which creates inertia, and hinders important health services research. By using a data warehouse, the data has already been brought together into a single source for researchers, saving time and effort in completing research projects, which allows a greater amount of projects to be accomplished. We will demonstrate efficiencies gained using a data warehouse to source the data by comparing it to current MHS practice of data acquisition and analysis using non-normalized data sources. The warehouse that has been created is named the Health Services Data Warehouse. We will be accessing the data warehouse using a data mart via SAS Enterprise Business Intelligence for analysis. To demonstrate practical application, we will use a research question on Traumatic Brain Injury and Mental Health as our proof of concept.

0830 The Health Services Data Warehouse (HSDW) in Action: Focus on Patient Centered Medical Home (PCMH)

AFMSA/SG60

Maj Claudine Ward

BACKGROUND: Acquisition of healthcare data, streamlined data management, and effective information delivery are trouble areas within our current military medical system. Healthcare data is collected across multiple forums, resulting in confusion among users and differing metrics for similar measures depending on which source is referenced. Information delivery is often slow and inefficient, resulting in decision delays. **INTRO:** The Air Force Medical Service Office of the Chief Information Officer (AFMS OCIO) is striving towards consolidating healthcare data into one location, the Health Services Data Warehouse (HSDW), to allow for centralized data management and standardized data transformation. The HSDW will also focus on improved information delivery by providing easily accessible, usable information to senior level leadership and medical staff through deliverables such as push-reports and dashboards. **METHODS:** To illustrate how the HSDW will be used, Patient Centered Medical Home (PCMH) data will be examined. Rather than measuring

performance measures based on production, PCMH focuses on healthcare outcomes of patients and efficient use of medical services. These new metrics must first be defined. Once defined, a PCMH data mart is created from HSDW, and contains the designated data elements related specifically to PCMH. With the data mart in place, PCMH push reports and dashboards are now created. CONCLUSION: The HSDW is intended to serve as the 'cornerstone of an informatics strategy to better support clinical decision support, business intelligence, agile development, and improved analysis including a de-identified research view of the data' (FY10 Air Force HSDW SOW v4) as is demonstrated through PCMH.

0900 The application of Johns Hopkins Adjusted Clinical Groupcase-mix system in AFMS

AFMSA/SG6H

Ms. Susan Chao

The Adjusted Clinical Group (ACG) Case-Mix System is a diagnosis- and medication-based risk-adjustment tool that has been adopted by more than 200 healthcare organizations in US and abroad and validated extensively in commercial and research settings over 15 years, but has only recently been implemented in AFMS. ACG offers a comprehensive family of measurements designed to help explain and predict how healthcare resources are delivered and consumed. Through its unique 'person-focused' approach, ACG captures the multidimensional nature of individual's health and morbidity burden of patient population, and it also can be used to identify and predict health care resource needs, enhance equitable distribution of limited resources, improve accuracy in provider profiling, streamline healthcare delivery, evaluate population health risk, and provide actionable information. FY09-FY10 M2 data were used to demonstrate capabilities of ACG and to validate its predictive models in AFMS-enrolled population. Sensitivity of predictive models for high total healthcare cost, high pharmacy cost and hospitalization were 39%, 69% and 28%, respectively, whereas the corresponding specificity were 97%, 98% and 96%, respectively. The performance of ACG in AFMS was comparable to that found in commercial HMO populations where the sensitivity for high total healthcare costs and hospitalization were 37% and 33%, respectively. This suggests that ACG can be applied to AFMS even though it was originally developed using commercial HMO and state Medicaid populations. AFMS leadership should take advantage of the readily available measures generated by ACG and, with these unparalleled and comprehensive measures, in turn develop effective population health policies.

0945 A Simulation-Based Program to Improve Non-technical Skills during Cardiopulmonary Resuscitation Patient Safety Center of Inquiry, Durham VAMC

Capt Alberto Bonafacio

INTRODUCTION: Sudden cardiac arrest is the leading cause of death in the United States. Code response training has traditionally focused on improving individual responders' technical skills and knowledge base. However, the impact of code response team performance, blending interpersonal and cognitive skills ("non-technical skills"), is increasingly recognized as critical for success in these scenarios. Since these skills are rarely evaluated, we developed a program for training and evaluating non-technical skills in code scenarios. METHODS: A high-fidelity, simulation-based program to improve non-technical skills among in-hospital code responders was implemented at a tertiary VA Medical Center. The Cardiopulmonary Resuscitation Team (CRT) program, comprised of three components (education, program evaluation, and quality improvement), was introduced to rotating departmental house staff over one year. Participants were oriented to code roles and responsibilities. Six times/month, 8-minute simulated arrest scenarios were conducted, followed by debriefing emphasizing communication/teamwork. Simulated code scenarios were videotaped and reviewed to evaluate CRT performance with respect to non-technical skills. RESULTS: Simulated code exercises were significantly improved with regard to task performance, communication, and organization, which has translated to more efficient "real-world" codes. Numerous parallel processes relevant to CRT performance (code cart organization, modified acquisition/delivery of laboratory samples, code documentation) have been improved and applied to actual clinical events.

CONCLUSIONS: Non-technical skills are essential to successful resuscitation efforts. The CRT program used high-fidelity simulation to enhance and maintain non-technical skills among in-hospital cardiac arrest responders. Comparison of pre- and post-implementation in-hospital cardiac arrest mortality data will be evaluated to further assess program effectiveness.

1015 Pediatric Critical Care Training Validation Using High-Fidelity Pediatric Simulation

711 HPW/USAFSAM-ETS

Lt Col Daniel Bruzzini

Purpose: First-year pediatric residents and those deployed to natural disasters, humanitarian crises, and counterinsurgency battlefields must have the capability of treating children with critical care needs.

Hypothesis: Teaching the Society for Critical Care Medicine's (SCCM's) Pediatric Fundamentals of Critical Care Support (PFCCS) course and incorporating high-fidelity simulation pediatric critical care scenarios will improve the fund of knowledge, self-confidence, and performance capability of first-year pediatric residents.

Methods: All pediatric residents at the St. Louis University School of Medicine and the University of Missouri were taught the SCCM PFCCS Course. Each student completed an SCCM standardized and validated pretest and posttest, a survey of 10 five-point Likert scale questions on managing critical children before and after, and 2 videotaped pediatric critical care simulations with debriefings after each scenario.

Results: Fund of knowledge improved from a pretest score of 60% to a posttest score of 80%. Pediatric residents reported feelings of preparation increased by an average of 0.97 points on the Likert scale. Ten of 11 pediatric residents indicated they thought the course was "extremely helpful." Pediatric critical care simulation time to recognize a failed airway went from 72 s to 46 s. The time to perform CPR, defibrillate with paddles, and give intravenous epinephrine decreased from 3.50 to 1.33 min.

Conclusions: Pediatric critical care fund of knowledge, self-confidence, and clinical performance were improved in pediatric first-year residents by the SCCM PFCCS Course with high-fidelity simulation, thereby validating it as an important training methodology in building pediatric critical care capability.

1045 Contemplating a New Model for Air Force Aerospace Medical Technician Skills Sustainment Training

59 MDW

SMSgt Robert Corrigan

Two decades ago, Aerospace Medical Technicians received robust skills sustainment training through exposure to multi-faceted patient treatment environments. Available training environments included inpatient care, outpatient care, and emergency services. This diverse training environment made possible through large operating budgets and an extraordinary infrastructure could not last. Today (after five separate base closure and realignment initiatives), medical funding and infrastructure is but a shadow of what it once was. Budgetary constraints and rising healthcare costs have necessitated a purposeful movement away

from inpatient and emergency care, toward outpatient and preventative medicine. While changes in Air Force health care delivery are necessary, the closure of inpatient and emergency services throughout the Air Force Medical Service significantly impacts our ability to prepare medical professionals and paraprofessionals for deployed operations. This research uses a mixed-methods framework (qualitative and quantitative) to demonstrate the importance of exploring alternative training models for medical skills sustainment training. Further, the study suggests an alternative training model that leverages existing network technologies (high fidelity patient simulation, asynchronous learning networks, and video-conferencing) to satisfy established learning objectives in the cognitive, affective, and psychomotor domains of learning. The proposed model offers a potential mitigation strategy for medical skills sustainment training limitations experienced in a post-BRAC era plagued by budgetary constraints and the near complete loss of inpatient and emergency services training platforms.

1245 Special Needs Assessment and Planning Environment for Emergency Operations Decision Making

711 HPW/USAFSAM-ETS

Mr. Aaron Miller

During man-made or natural disasters, significant segments of the population have special medical needs that are not addressed by current emergency operations processes. These patients are often neglected during disasters due to limited resources resulting from insufficient knowledge of a system's capacity to respond to their needs.

A research and development project was conducted to: (1) assess the availability of detailed infrastructure data regarding population, medical facilities, and transportation resources and (2) identify a simulation tool capable of modeling the human behaviors of victims and responders during an emergency. The combination of these data and tool resulted in the Special Needs Assessment and Planning (SNAP) environment. Modifications to the user interface include app-based access from mobile devices. SNAP is a decision support tool that quickly and easily conducts statistical predictions of resource needs for supporting special medical needs patients. Further, as actual data are provided to the Emergency Operations Center (EOC), reassessments using live data should provide a continuing series of predictions in real time. To evaluate the fidelity of the SNAP environment, SNAP will be tested in Hamilton County, Ohio, in May during "Shaken Horizons," a multiregion exercise simulating local, regional, and national multidomain response to a large-scale earthquake. SNAP will be used inside the county's

Emergency Planning Collaborative and provide medical facility and fire/rescue resource utilization predictions during the multiday event. Results from the actual event and the after-action review will be presented to illustrate SNAP's utility to EOC decision makers.

1315 Utilization of a Prescreening Instrument for the Selection of Special Duty Personnel

711 HPW/USAFSAM-FEC

Dr. Joe Wood

Selecting the highest caliber personnel for Air Force special duty assignment is crucial for reducing training attrition, increasing retention, and improving operations critical to national security mission readiness and completion. The procedures for assessment and selection of special duty personnel can be a time-consuming and expensive process. However, utilizing an empirically validated prescreening instrument can be one of the more cost-effective methods of refining the applicant pool prior to an in-person assessment and selection (A&S), thus avoiding the costs associated with travel, lodging, and lost time on the job for the applicant in addition to reducing the resources needed by staff at the A&S. This study evaluated the usefulness of an empirically validated "select out" web-based prescreening instrument assessing medical, psychological, and interpersonal aspects of functioning. Out of the 1100+ potential applicants who completed the prescreen survey between 2005 and 2009, approximately 52% were identified as having concerning information affecting their fitness and suitability for a high-demand, high-risk special duty career field. In total, 78% of those

flagged were eliminated from consideration after additional review by unit leadership. These eliminations are estimated to have provided savings of more than \$200,000 per year. Additionally, the use of the instrument has significantly improved (a) the quality of the pool of applicants invited to attend A&S and (b) our understanding of the prerequisites needed to successfully adapt to the training and operational rigors of a special duty assignment. Distribution Statement A: Approved for public release; distribution is unlimited. Case Number: 88ABW-2011-2432, 27 Apr 2011

1345 Benefits of Operational Testing and Why it's Important

AF Medical Evaluation Support Activity

Maj James Weinstein

Educate AFMS personnel on the importance of Operational Testing of medical equipment and systems (i.e. UTCs). The Air Force Medical Evaluation Support Activity is charged with conducting Operational Test and Evaluation (OT&E) of medical and IM/IT equipment, and systems by the Air Force Surgeon General. AFMESA is the AF's premier medical operational test activity. AFMESA testing expertise has drawn the attention of other DoD components, and government agencies. This briefing will explain how AFMESA conducts OT&E, why it is necessary, how it differs from developmental testing and current trends in DoD acquisition that are driving changes to test processes. The presentation will conclude with a review of recent test programs highlighting the breadth of testing environments, scope of testing, and our numerous test customers.



Closing Plenary Session

**Presentation slides are in appendices as noted.*

| | |
|--|---|
| Ms. Amy Tursky Defense Technical Information Center | <i>DoD Research Database (Appendix G)</i> |
| Ms. Jessica Candia Human Compliance SGE-C | <i>AFMS Human Subject Issues and Updates (Appendix H)</i> |
| Lieutenant Colonel David Bentzel Animal Compliance SGE-C | <i>AFMS Animal Use Issues and Updates (Appendix I)</i> |
| SG5/SG9 Q & A Panel Colonel Chip Terry and Colonel Patricia Reilly | <i>Modernization 101: Process and Funding</i> |
| Lieutenant General Bruce Green Air Force Surgeon General | <i>Awards Ceremony</i> |



Poster Abstracts



ABSTRACTS

Poster Abstracts

Tuesday, 2 August, 2011

1. Cardiovascular Risk Assessment and Management (CRAM) Project

AFMSA/SG6H
Dr. Celan Alo

Death rates from cardiovascular disease (CVD) have declined, yet the burden of disease remain high. On the basis of the 2007 US mortality data, more than 2200 Americans die of CVD each day, an average of 1 death every 39 seconds. Approximately every 25 seconds, an American will have a coronary event, and approximately every minute, someone will die of one. Air Force personnel continue to have increasing risk for developing CVD especially coronary heart disease (CHD). The prevalence rates for risk factors for CVD among ADAF have been increasing or have remained steadily high. Improving early identification, care prioritization, and management of ADAF at higher than normal risk for developing CHD is an important aspect in MTF health promotion activities for the active duty personnel. However, existing paper and web-based CHD risk calculators require time-consuming medical record and laboratory data review. The CRAM was developed to assist SGHs, providers, HCIs and PCE teams to assess, diagnose, and manage CHD and/or its risk factors among ADAF. In addition, the project aims to improve MTF staff efficiency by reducing lengthy chart review and by calculating the 10-year CHD risk – potentially saving the AFMS 1500 man hours annually! This presentation reviews the data management process of the CRAM project – specifically how clinical and laboratory data that are necessary for the calculation of the 10-year CHD risk are pulled and processed into the PIMR interface.

2. Creating a Self-Regulated Learning Assessment Methodology for Struggling Military Medical Students

Uniformed Services University
Anthony Artino, CDR

Background: When medical students are unable to display adequate performance, medical educators typically provide some type of remediation.

Purpose: The overarching goal of this project is to develop an effective diagnostic and remediation methodology that can be used to help struggling medical students develop the skills associated with higher-performing trainees and practicing physicians.

Method: Using a novel assessment technique, self-regulated learning (SRL) microanalysis, we developed initial assessment questions from the literature on social-cognitive theory. From this theoretical perspective, SRL is defined as a cyclical process whereby individuals use self-generated feedback about their learning to optimize their strategic pursuit of personal goals (Zimmerman, 2000). Self-regulation is typically conceptualized as a teachable skill that operates as a three-phase cyclical loop, whereby processes preceding action (forethought) impact learning efforts (performance), which in turn affect how learners react to and judge their performance successes and failures (self-reflection). Results: We created forethought, performance, and self-reflection questions for a diagnostic reasoning task embedded in a second-year medical school course at the Uniformed Service University. We then developed interview questions and are currently pilot testing the protocol. In the next phase, we will determine the capability of the protocol to identify qualitative/quantitative performance differences in key self-regulatory processes between struggling students and their high-performing counterparts. Conclusions: The developed protocol has the potential to enhance our understanding struggling medical students and provide valuable diagnostic information to help remediate those students.

During the presentation, we will provide theoretical and empirical support for our SRL

model; describe our development process; and present preliminary validation data.

3. Exploring Diabetes Care Using AFMS Informatics Resources: Should Adjustments for Patient Characteristics be Considered When Measuring Quality?

AFMSA/SG6H

Ms. Brooke Asbury

Based on HEDIS® scores, some military treatment facilities (MTFs) underperform on selected diabetes care measures compared to national benchmarks and other MTFs. As an exercise in leveraging existing AFMS informatics resources to target patients for care, the Air Force Medical Service (AFMS) Applied Clinical Epidemiology (ACE) team mined AFMS data systems to identify where gaps in diabetes care are occurring as reflected by AFMS performance on several HEDIS® measures. Also, to determine if performance is partially related to patient factors outside of MTF control that could be adjusted for when comparing HEDIS® scores within the AFMS, ACE examined selected characteristics of March 2010 MTF-enrolled, TRICARE Prime and Plus diabetics. Results were further validated using November 2010 data. Only patients with MTF visits in the past year were included in analyses. From multivariate logistic regression, male gender, older age, presence of Primary Care Manager (PCM) visit, and presence of 1+ insulin dispensing event in the past 2 years predicted better glycemic control. Female gender, older age, presence of PCM visit, and absence of dispensed insulin predicted better LDL control. After adjustment by age and gender, two salient patient-level characteristics not under MTF control, differences persisted in MTF adjusted scores for some measures. Though arguably all patients' outcomes should be held to HEDIS® standards, adjustment by age, gender and perhaps other sociodemographic case-mix factors described in literature may allow for fairer comparison of HEDIS® scores for performance-based payment initiatives and other AFMS-internal reporting initiatives.

4. Environmental Detection of Airborne Virus

711 HPW/USAFSAM-PHT

Dr. James Baldwin

Traumatic Environmental detection of disease-causing organisms is an excellent way to assess the risk of infection in personnel. Under investigation is the use of commercial off-the-shelf (COTS) air sampling technology in combination with wide-spectrum polymerase chain reaction (PCR) based tests to detect pathogens of interest in the environment. We sampled air in a Lackland sick bay on several occasions to demonstrate the effectiveness of a selection of air sampling equipment. Detection of airborne virus was typically possible using low-cost air sampling equipment and domestic filters that cost between \$30 and \$200 per unit. DNA extraction from this diverse selection of filter types (liquid, heap type, and electrostatic) was easily accomplished. Furthermore, the use of laboratory grade equipment such as XMX and Coriolis air samplers was not correlated with significant improvement in qualitative detection rates. A serotyping pyrosequencing assay detected several diverse strains of virus, including, but not limited to, rhinovirus, corona virus, and adenovirus. The ease with which we were able to demonstrate airborne virus detections using COTS air sampling technology and PCR opens the door for more cost-effective routine risk assessment and epidemiology tests. Of greater interest is the use of low-cost equipment that could be fielded in advance and operated for an extended period with limited human interaction. This can provide a long-term, after-the-fact sample of environmental virus exposure when it is requested.

5. Intravenous hydroxocobalamin versus intraosseous hydroxocobalamin in the treatment of acute, severe cyanide toxicity in a validated swine model

59 EMDS

Lt Col Vikhyat Bebart, MD

Background: A simple, non IV administration routes are needed for first responders, military troops, and emergency department staff. Intraosseous infusion is simple and an effective route for other resuscitation drugs.

Objective: To compare the return to baseline of mean arterial blood pressure (MAP) between 2 groups of swine in acute cyanide toxicity and treated with IV HOC or IO HOC.

Methods: 24 swine (48-52 kg) were intubated, anesthetized, and instrumented. Cyanide was infused until severe hypotension. Animals were randomly assigned to IV HOC or IO HOC and monitored for 60 min.

Results: Baseline mean weights, time to hypotension, and cyanide dose at hypotension were similar. At hypotension mean MAP (45, 45 mg Hg), blood cyanide (3.5, 3.1 mcg/ml) and lactate levels (8.9, 8.8 mmol/L) were similar. 10/12 animals in the IV group and 10/12 in IO group survived ($p=1.0$). Both groups has a similar return to baseline MAP and had similar MAP until end of the study ($p=0.997$). CO, SVO₂ and SVR were similar between groups ($p>0.4$). Bicarbonate, pH, and lactate, levels were similar ($p>0.8$). Cyanide levels were undetectable after HOC infusion through study end in both groups ($p=1.0$). Cerebral and renal NIRS oxygenation were also similar ($p>0.9$). Serum nitrotyrosine rose during CN infusion in all animals, and decreased similarly in both arms after HOC infusion ($p>0.5$). TNF- α , IL-1 β , IL-6, and IL-10 were similar between groups.

Conclusions: Intraosseous infusion of hydroxocobalamin was found to be equally efficacious to intravenous administration of hydroxocobalamin in our validated animal model of cyanide toxicity.

6. Use of Intraosseous Hydroxocobalamin for treatment of hemorrhagic shock in an adult swine (*Sus scrofa*) model - a pilot study

Enroute Care Research Center

Lt Col Vikhyat Bebart, MD

Objective: Determine if hydroxocobalamin is effective in improving blood pressure in a swine hemorrhagic shock model. **Methods:** We completed a prospective interventional study infusing hydroxocobalamin through an intraosseous needle in the proximal tibia, in a swine model after inducing hypovolemic shock. Three groups made up of two swine each received different doses of hydroxocobalamin. Statistical analysis was performed using analysis of variance (ANOVA). **Results:** The mean weight was 74 Kg. MAP at Baseline and hypotension were similar (Table). MAP comparison post hydroxocobalamin administration revealed a $p < 0.001$. Baseline SVR for each group was 841.5 (SD 36), 975 (SD 24) and 642.5 (SD 3.5). At hypotension the mean SVR was similar in all groups. The mean SVR for each group in the 90 min post administration of hydroxocobalamin was 1025 (SD 194) for group 1, 1099 (SD 135) for group 2 and 726 (SD 130) for group 3 ($p < 0.001$). Baseline Heart Rate (HR) for group 1 was 96.5 (SD 19), 75 (SD 10) for group 2 and 76 (SD 10) for group 3. After hypotension the mean HR for group 1 was 96 (SD 25), 95.5 (SD 5) for group 2 and 78.5 (SD 0.7) for group 3. At 90 min post administration of hydroxocobalamin the HR was 106 (SD 7) for group 1, 90 (SD 5) for group 2 and 83 (SD 13) for group 3 ($p < 0.001$). **Conclusion:** Intraosseous hydroxocobalamin significantly increased MAP and SVR in our pilot, dose-finding hemorrhagic shock swine model.

7. Critical Care Air Transport Team (CCATT) short term outcomes of casualties with spinal fractures moved with the Vacuum Spine Board between 2009 and 2010

Enroute Care Research Center
Lt Col Vikhyat Bebartha, MD

Objective: To describe the outcome of patients managed by CCATT with the Vacuum Spine Board (VSB) to stabilize unstable spine fractures between July 2009 and June 2010. **Methods:** We performed a retrospective chart review evaluating short term events/outcomes of casualties transported on the VSB by CCATT. Complications and the Injury Severity Score (ISS) were obtained from the Joint Theater Trauma Registry (JTTR). All data was reported in a descriptive manner.

Results: 73 patients met the inclusion criteria, resulting in 107 patient moves. The MOI was explosion in 48 (65.8%), blunt in 22 (30.1%) and penetrating in 3 (4.1%). The mean ISS was 23.5 (SD 13.4). 64 patients were ventilated (59.8%), 10 received vasoactive medications (9.4%), and 13 received blood products (12.2%). Regarding complications: 10 had skin breakdown associated with the VSB (9.3%) and there were 2 cases of neurological deterioration which were attributed to progression of the original neurological insult (1.9%). There were 3 episodes of transient desaturation (2.8%) and 13 of transient hypotension (12.2%). We did not encounter any deaths, loss of airway or chest tubes. The primary limitations include the retrospective and descriptive nature of the study as well as the small number of casualties studied.

Conclusion: The VSB was successfully used to stabilize spine injuries during transport. We did note a skin breakdown rate of 9.3%. A risk/benefit assessment must be performed before deciding to use the VSB to transport casualties with spine injuries.

8. The Effects of Sympathetic Nervous System Activation on Brain and Behavior

Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury
Dr. James Bender

This poster will summarize existing literature about changes to the human brain secondary to acute stress (sympathetic nervous system activation). Brain structures and pathways that are altered during periods of acute, intense stress (prefrontal cortex, amygdala, mesocortical and mesolimbic pathways, etc) will be summarized, along with their function.

Most importantly, behavioral and psychological consequences of these changes will be discussed. Drawing examples from combat, combative sports, and police performance, the poster will explain why some servicemembers suffer from decreased performance like poor marksmanship or poor execution of battle drills during combat situations. A thorough understanding of stress responses will aid in training servicemembers who, unfortunately, may be exposed to extreme acute stress during their deployment. This poster directly relates to the human performance area of the Force Health Protection track.

The poster will be divided into three sections:

- Specific brain structures and pathways affected by acute stress along with their function
- Behavioral consequences of these changes
- Implications for military training

This poster will not address the effects of chronic stress on physical or psychological processes.

9. Sub-Maximal Arterial Saturation Adaptations with Habitation Time at Moderate Altitude

USAFA - Department of Biology & Human Performance Laboratory
United States Air Force Academy,
USAFA, CO, 80840

Cadet Robert Blank, Anthony G. Pompa, Elvira N. Chiccarelli, Patrick S. Ryan, Joshua D. Stanley, Trever S. Symalla, Kevin E. Wright, Melanie L. Grogger, David A. Welge, Jeffrey L. Nelson, and Michael D. Brothers

Introduction: Data from previous studies at the U.S. Air Force Academy (USAFA) revealed significant changes in hematological and physiological parameters following adaptation and de-adaptation to moderate altitude (MA; ~2210m). These findings may be related to chronic time spent at MA. **Purpose:** This study examined differences in arterial saturation (SaO₂) among four class years of USAFA cadets who remained at MA or sojourned to sea level (SL: < 330m) for a three-week winter break. It was hypothesized that SL cadets would display reduced SaO₂ values during aerobic exercise which would vary depending on class year. **Methods:** Thirty one subject's (27 male, 4 female) SaO₂ was estimated via pulse oximetry at rest and during treadmill-based exercise (running at 5.0, 6.0, & 7.0 mph) prior to departing for winter break, immediately upon return, and roughly one month after re-acclimatization to MA. Concurrently, each subject's total hemoglobin mass (THM) was assessed at each stage using the optimized carbon monoxide re-breathing protocol. **Results:** A significant ($p < 0.05$) main effect of altitude was found between the lower class (freshmen and sophomores) SL cadets compared to the MA controls at 7.0 mph which neared significance at the other velocities. In addition, there was a near significant ($p = 0.063$) difference between lower- and upper-class SL subjects immediately following winter break. Significant changes in THM were observed in all SL subjects, with the lower class cohort displaying the greatest change. **Conclusions:** Chronic residence time at

MA appears to influence hematological parameters following a short sojourn to SL.

10. Detection of Retinal Proteins in Saliva and Serum in Laser Induced Retinal Injuries in Rabbits

Summa Health System
Mr. Rachida Bouhenni

Purpose: Retinal injuries affecting the photoreceptors and/or the retinal pigment epithelium (RPE) may result in leakage of retinal-specific proteins into the systemic circulation. These proteins could be detected in body fluids following the injury and vary with the severity of the injury and during the subsequent recovery period.

Methods: Using a continuous 532 nm laser, 50 spots of mild (MVL), moderate (GII), or severe (GIII) laser lesions were created in retinas of Dutch Belted rabbits ($n=12/\text{grade}$). Serum and saliva were collected from treated and control animals at 1hrs, 4hrs and 24hrs following laser treatment. Retinal-specific proteins were detected using Liquid Chromatography/Tandem Mass spectrometry. Statistical analyses were performed using One way ANOVA. $P < 0.05$ was considered significant.

Results: Retinal-specific proteins were detected in both saliva and serum samples at all time points after laser injury. Most proteins were detected in the samples treated with MVL at 4hrs, followed by GII and GIII laser lesions. Some of the proteins were common to more than one laser grade. Although, more proteins were detected following treatment with mild lesions, and at 4 hrs after treatment, the differences between groups were not significant. **Conclusion:** Retinal-specific proteins were detected in both saliva and serum of rabbits following laser treatment. The numbers of proteins detected did not vary with severity and time following injury. The biomarker response appears transient, peaks at 4 hours after laser treatment and is reduced at 24hrs. These proteins could be used as biomarkers for laser induced retinal injuries in military operations.

11. Air National Guard Perceptions of Features for a Portable Handheld Device to Detect Directed Energy

University of Illinois at Chicago
Dr. Andrew Boyd

Developing a portable handheld device (the Tricorder) for medical personnel to detect directed energy requires a number of compromises to decrease device size. While compromises can address the Tricorder's technical "correctness," ensuring ultimate "use" requires social and technical insight informing its development; task saturation of medical personnel remains a significant challenge to overcome—the Tricorder cannot be another nuisance. After obtaining the appropriate Institutional and Air Force permissions, we conducted a qualitative experiment (Q-methodology) during a monthly drill with medical personnel of an Air National Guard wing to help prioritize features to guide future development. The study had three phases: First phase - medical personnel used a Q-sort (a survey instrument) to explore features of the Tricorder as an abstract concept; Second phase - researchers provided personnel a briefing on the Tricorder and a chance to interact with the prototype; Third phase - medical personnel took a second survey using Q-sort to reevaluate the features of the Tricorder. The first phase Q-sort revealed four factors, named: 1) easy to use, high reliability, high sensitivity; 2) tactical efficiency; 3) where am I & do others know; and 4) special ops perspective. Sort results from the first and third phases differed by three of four factors. Following the briefing and demonstration, the factors were: 1) medical care & alert notification; 2) tactical efficiency; 3) works in hostile environment; and 4) alert & fix. Additional development of the Tricorder will balance these competing views among medical personnel to improve the device.

12. Field Portable Toxicity Sensor for Army Drinking

U.S. Army Center for Environmental Health Research
Ms. Linda Brennan

The U.S. Army Center for Environmental Health Research (USACEHR) is developing toxicity sensors for an Environmental Sentinel Biomonitor (ESB) system to provide rapid identification of toxicity from a broad spectrum of industrial and agricultural chemicals which may contaminate Army field drinking water supplies. Desirable performance characteristics for the ESB system include a rapid response to a selected panel of 18 toxic industrial chemicals within a defined sensitivity range, adequate shelf life for consumables, and size and weight characteristics consistent with field portability. A combination of two technologies can detect all 18 chemicals with 12 out of the 18 in the desired concentration range in less than 90 minutes. The sensors include an electric cell-substrate impedance sensing (ECIS) system, which uses fluidic biochips seeded with rainbow trout gill epithelial cells (designed through a collaboration with Agave Biosystems, Inc.), and a handheld assay (HHA) kit for the detection of acetylcholinesterase pesticides (designed through a collaboration with ANP Technologies, Inc.). The ECIS biochips can be maintained for up to one year at 6°C with no media replacement and still remain viable for ECIS toxicity testing, while the reagents for the HHA kit have a projected shelf life of more than 9 months at room temperature. Each sensor prototype will be developed into hand-held units. The compact sizes, long, maintenance-free shelf lives, and chemical sensitivity of these technologies make them excellent candidates for an ESB system that will provide a significant improvement over current capabilities for identifying chemically-contaminated field drinking water supplies.

13. Aptamer-based optical detection of heavy metal ions as a platform for a portable handheld sensing device for environmental monitoring

University of Illinois at Chicago
Ms. Kimber Brennehan

The detection of heavy metals in the environment is necessary due to the toxic effects of bioaccumulation in humans. For example, mercury exposure can come from dental amalgams, fish consumption, and drinking water. We are using single stranded DNA aptamers as a molecular recognition element in a sensing strategy for heavy metal ions. Aptamers can interact with a broad range of targets and can be selected for new targets via a chemical selection process. The interaction of an aptamer and target molecule generally causes a conformational change. We will couple this detection method with the fluorescence of semiconductor quantum dots and the quenching ability of gold nanoparticles to measure the presence of heavy metals. A quantum dot and a gold nanoparticle can be conjugated to an aptamer in a way that allows fluorescence when the DNA is in a random coil configuration, but permits a reduced level of fluorescence when in a folded conformation, which happens upon interaction with a target. This occurs through an energy transfer process between the quantum dot and gold nanoparticle when they are brought within close proximity of each other. The process is known as surface energy transfer (SET). The robustness of quantum dots and gold nanoparticles compared with organic dyes will be advantageous in translating this assay into a handheld device. We will display our design for a portable, handheld device for measuring the presence of heavy metal ions, as well as biomarkers for heavy metal poisoning.

14. Noninvasive Continuous Hemoglobin Monitoring in Seriously Injured Combat Casualties

HAF/SG1N
Col Elizabeth Bridges

Purpose: Determine the agreement and precision of noninvasive continuous hemoglobin (SpHb) compared to standard laboratory Hgb values in seriously injured combat casualties. Methods: Patients were monitored with a noninvasive pulse oximeter (Masimo Rainbow SET, Probe Rev E), which provides continuous hemoglobin. Intermittent laboratory Hgb values were obtained from the iStat or laboratory Coulter. Results: Data were collected from 24 seriously/critically injured combat trauma patients (age 29 ± 9 , mean injury severity score 20 ± 9.8 ; 97% male). Injuries were primarily due to IEDs (67%) or GSW (17%). Casualties received a mean of 3.7 ± 3.3 units PRBCs (425 ml/unit; median = 3, range 0-10). Hgb ranged from 4.4-15.1 gm/dl. Forty nine data pairs were analyzed. Each subject contributed 1 to 5 pairs (median 2). Bias (SpHb-Hgb) was 0.5 ± 1.7 gm/dl (95% LOA -2.9, 3.9). Overall 60% of paired samples had a bias < 1 gm/dl (65% of SpHb Coulter Hgb and 53% of SpHb-iStat Hgb pairs). Conclusions: The laboratory method (iStat vs Coulter) introduced measurement error. Based on the SpHb-Coulter data the bias (0.3 gm/dl) is comparable to studies in healthy subjects and stable surgical patients; however, there is less precision (1SD = 1.6 gm/dl) than previously reported (0.5-1.3). The lack of precision may reflect the severity of injury and ongoing damage control resuscitation. The noninvasive SpHb is not precise enough to be used as a transfusion trigger. Analysis is ongoing to determine if SpHb is useful in trending Hgb changes and if it precedes clinical deterioration.

Funding: TriService Nursing Research Program.

15. The research maze and the wheels of progress: How the Health Services Data Warehouse will transform the way research is done

AFMSA/SG6H
LtCol David Carnahan

There are many challenges inherent in every observational study. In the Military Healthcare System (MHS), one of the biggest is accessing the many TB's of data that represent the medical care of 9.6 million MHS beneficiaries. The current process requires a clinical analyst to access multiple data sources with non-normalized files, determine relationships between the files, write computer code to establish linkages, which ultimately transforms flat files into analytic datasets needed for analysis. In some cases, to answer the research question appropriately requires multiple individuals to bring together data across different organizations to develop the dataset. This can be a great source of frustration, and a great deal of time spent which creates inertia, and hinders important health services research. By using a data warehouse, the data has already been brought together into a single source for researchers, saving time and effort in completing research projects, which allows a greater amount of projects to be accomplished. We will demonstrate efficiencies gained using a data warehouse to source the data by comparing it to current MHS practice of data acquisition and analysis using non-normalized data sources. The warehouse that has been created is named the Health Services Data Warehouse. We will be accessing the data warehouse using a data mart via SAS Enterprise Business Intelligence for analysis. To demonstrate practical application, we will use a research question on Traumatic Brain Injury and Mental Health as our proof of concept.

16. Changes in Total Hemoglobin Mass and Running Economy During De-Acclimatization and Re-Acclimatization of Moderate Altitude Residents

United States Air Force Academy
Department of Biology & Human Performance Laboratory
C1C Elvira N. Chiccarelli, Robert H. Blank, Anthony G. Pompa, Patrick S. Ryan, Joshua D. Stanley, Trevor S. Symalla, Kevin E. Wright, David A. Welge, Melanie L. Grogger, Jeffrey L. Nelson and Michael D. Brothers

Introduction: Previous research demonstrated that cadets returning to moderate altitude (MA: ~2200m) from sea-level sojourns (SL: <330m) have significant loss in total hemoglobin mass (THM); this loss may be related to chronic MA residence time. Purpose: This study examined changes in THM and running economy immediately following and six wks post a 21-day SL sojourn among subjects that had resided chronically at MA for 1-4 yrs. Methods: Twenty-seven male subjects (17 SL-travelers, 10 MA controls) aged 20.8 ± 1.5 yrs had their THM determined via the optimized carbon monoxide re-breathing protocol. RE was assessed as steady-state oxygen consumption (mL O₂/kg bodyweight/min) during treadmill-based exercise at three separate velocities (5.0, 6.0, 7.0 mph). Testing consisted of three phases: three wks pre-SL, within two wks post-SL, and six wks post-SL. Statistical analysis consisted of independent and paired t-tests and Pearson's correlation. Results: Significant (p < 0.05) altitude-related differences were evident between MA and SL cadets in post-SL testing. SL subjects displayed a significant reduction in THM (4-6%) immediately post-SL, and a significant increase (3-5%) six wks post-SL. There was a near-significant (p = 0.09) difference between the underclass cadets and MA controls six wks post SL-exposure. Significant (p < 0.05) changes were also evident in RE, but no significant correlation was found between THM and RE. Conclusions: Our data suggest that MA exposure time may affect the degree of de/re-acclimatization of THM, but does not affect RE,

which changes following a SL sojourn but appears to be independent of blood adaptations.

17. Contemplating a new model for Air Force Aerospace Medical Technician skills sustainment training

United States Air Force School of Aerospace

M59 MDW

SMSgt Robert Corrigan

Two decades ago, Aerospace Medical Technicians received robust skills sustainment training through exposure to multi-faceted patient treatment environments. Available training environments included inpatient care, outpatient care, and emergency services. This diverse training environment made possible through large operating budgets and an extraordinary infrastructure could not last. Today (after five separate base closure and realignment initiatives), medical funding and infrastructure is but a shadow of what it once was. Budgetary constraints and rising healthcare costs have necessitated a purposeful movement away from inpatient and emergency care, toward outpatient and preventative medicine. While changes in Air Force health care delivery are necessary, the closure of inpatient and emergency services throughout the Air Force Medical Service significantly impacts our ability to prepare medical professionals and paraprofessionals for deployed operations. This research uses a mixed-methods framework (qualitative and quantitative) to demonstrate the importance of exploring alternative training models for medical skills sustainment training. Further, the study suggests an alternative training model that leverages existing network technologies (high fidelity patient simulation, asynchronous learning networks, and video-teleconferencing) to satisfy established learning objectives in the cognitive, affective, and psychomotor domains of learning. The proposed model offers a potential mitigation strategy for medical skills sustainment training limitations experienced in a post-BRAC era plagued by budgetary constraints and the near complete loss

of inpatient and emergency services training platforms.

18. AMIGO Clinical Study: Attrition rates among Military beneficiaries undergoing Intensive Group Outpatient care...Following Diabetes Prevention and Research Opportunity in Primary Care

USAF, 779 MDG

Ms. Jennifer Dean

The Diabetes Care Initiative (DCI) at Joint Base Andrews Naval Air Facility, Malcolm Grow Medical Center (MGMC) functions as a specialized associate clinic of the larger Family Health clinic and Medical Center. Approximately one year ago, driven by Congressional funds allocated for prediabetes management, the DCI was formed and tasked with primary implementation of the Group Lifestyle Balance Program (GLBP). The GLBP, proven to aid in the prevention of type 2 diabetes by virtue of education and lifestyle intervention, was implemented at MGMC with much success. Initial observations revealed, since program inception, the DCI has enrolled over 110 patients in 14 separate classes. Graduates to date, have lost a combined total of approximately 500 pounds with only 27% of patients lost-to-follow-up (i.e., did not complete the entire 12 week course). Based on these preliminary findings, the DCI hypothesizes patient retention in a community hospital setting is a direct result of the personalized approach each DCI lifestyle coach gives to their respective patients. With the goal of translating this hypothesis and these initial observations into standard practice, the DCI has designed a study that will attempt to provide evidence in support of personalized coaches in prediabetes care. The AMIGO (Attrition rates among Military beneficiaries undergoing Intensive Group Outpatient care) study will capitalize on the current standard of care practice (i.e., GLBP) and use this platform to research the impact a lifestyle coach has on both patient retention and the program's clinical success.

19. Development of a Checklist to Enhance Patient Safety in Enroute Care

711HPW/USAFSAM-FER
Maj Susan Dukas

A growing number of inadequate or missing patient hand-offs has been reported in the TRANSCOM Regulating and Command & Control Evacuation System (TRAC2ES) in 2009 and 2010. An association between poor communication and mishaps and errors in hospitals has been demonstrated. Evidence based practices in the development of checklists in hospitals have shown dramatic reductions in mishaps and errors. A standardized, concise patient hand-off checklist can help improve communication and foster patient safety in the aeromedical evacuation (AE) environment. Safety checklists include only items that should be addressed. Long unorganized checklists are seldom used. The recommended steps to develop a checklist include reviewing the existing literature, understanding the needs of the users, including a multidisciplinary group, and using an iterative approach for pilot testing and validation. The SBAR mnemonic (situation, background, assessment, recommendation/request) was used in the creation of the evidence-based patient hand-off checklist. Literature review, expert opinion, and co-existing adverse event categories of medication errors and patient preparation helped guide the creation of the checklist. Active duty, reserve, and guard nurses were consulted for input regarding design, feasibility, appropriateness, and validity of the checklist. Checklists can be powerful tools to standardize work processes and create independent checks for key processes. While the science of checklists, much like the science of safety and quality, is immature, many believe medical checklists can help prevent errors, mitigate harm, and reduce cost. Distribution Statement A: Approved for public release; distribution is unlimited. 88ABW-2011-2028, 5 APR 11.

20. Nanomaterial Hazard Identification: The Zebrafish Model for Rapid Material Testing

349th Medical Squadron (349 MDS)
Maj Joseph A. Fisher

Oregon State University
Dr. Robert L. Tanguay

Force Health Protection is facing a new challenge both in-garrison and in deployed operations as the nanotechnology revolution begins. The National Science Foundation predicts the period from 2011-2020 will result in fundamentally new products based on nanomaterials. These chemical biophysical nanometer scale (i.e., 1×10^{-9} meters) materials may bring new or increased hazard to humans and the environment, and the uncertainty surrounding their risk to biological and environmental health needs to be investigated. Health risk can be defined as a function of hazard and exposure, and an understanding of the hazard and exposure of these materials is important in order to minimize health risk. Products utilizing nanoscale materials will become ubiquitous throughout commerce in the coming years and regulatory oversight and reporting in the EU and the US is moving forward. The development of the zebrafish (*Danio rerio*) model for rapid material testing bridges a gap in toxicology testing between in vitro cell culture models and in vivo mammalian models. The anatomy, physiology, and genomics of the zebrafish are highly homologous to humans, and these similarities are just beginning to be exploited by research communities. Being a whole animal vertebrate organism, zebrafish allow for great flexibility in conducting experimental assays to identify nanomaterial exposure effects in morphology, physiology, behavior, and distribution. This research presents an overview of the issues surrounding nanomaterial health risk and provides testing results in order to demonstrate the utility of the zebrafish model in answering nanomaterial biocompatibility research questions.

21. Size Dependent Gene Expression Induced by Gold Nanoparticles

711 HPW/RHPBA
Ms. Carol Garrett

Gold nanoparticles (Au NP) have shown promise as novel materials for therapeutics, imaging, diagnostics and delivery systems due to their unique properties including their small size, plasmonic nature, relative biocompatibility and low toxicity. However, unanticipated alterations at the genomic level may still contribute to long term health consequences. Here, we demonstrate that HaCat cells exposed to gold nanoparticles of well-defined sizes produce unique gene expression profiles. Using Human Genome microarrays, we show that human keratinocytes differentially express 368 genes when exposed to Au NP. Ingenuity® Pathway Analysis revealed that the genes were involved in cell-mediated immune response, cellular development, organization and maintenance, and stress response. Moreover, there are size-dependent differences in the gene expression profiles of these materials. The smallest gold particles (10 nm) were internalized in the greatest amounts and induced genes involved in DNA damage and repair, and apoptotic signaling mechanisms. By comparison, the largest particles (60 nm) suppress genes responsible for maintaining intracellular stability, cell signaling and cell cycle regulation, which act to inhibit genes which maintain homeostasis. The discrete size effects are further evidenced by changes in G-protein coupled receptor signaling produced upon exposure to the intermediate-sized 30nm gold particles. Therefore, these results provide strong evidence for the size- and composition-dependent response of cells to gold nanoparticles. These findings have strong implications regarding the relationship between size and uptake in gold nanoparticle-mediated gene alterations. These implications should be considered in future design and use of gold nanoparticles as revolutionary therapeutic agents in biological systems.

22. Portable Biosensor for Protein Targets

UIC CADRE
Mr. Igor Gavin

The specific physiological response associated with exposures to directed energy and the biomarkers of resultant tissue injuries are poorly characterized. We are lacking in our ability to diagnose and quantify any subsequent degree of exposure-related damage. Cellular injury results in release of tissue-specific proteins into the circulatory system triggering immunological responses. It is possible to detect these biochemical signatures associated with the cellular damage and determine the extent of inflicted injuries in exposed individuals. Our goal is to develop a field-ready portable biosensor platform for detecting protein biomarkers appearing in human bodily fluids (saliva, serum, etc.) which are the direct result of focused energy impact. A recently developed method based on modifications to sandwich enzyme-linked immunosorbent assay (ELISA) in conjunction with electro-chemical detection (ECD) possesses both the sensitivity and specificity required to competently identify protein biomarkers in serum. Current technology utilizes microarrays of 12,000 electrodes; each electrode can be used either individually or in blocks as a substrate for customized multiplex ELISA. We optimized this technology further by introducing both customized substrates to increase antibody immobilization, and chemical signal amplification to boost the signal. The combination of these improvements with modifications to the assay parameters aimed at reducing the background, significantly increased the sensitivity of protein detection. The resulting device will have the capability of detecting protein targets in a fully automated sample-to-answer field test, which can be readily reconfigured to change target selection.

23. Frozen Red Blood Cell Transfusion

USAF / 60 MDG

Department of Surgery, David Grant USAF Medical Center, Travis AFB, CA
Clinical Investigations Facility, David Grant USAF Medical Center, Travis AFB, CA

Lt Col Dustin Zierold¹, Lt Col Elizabeth Bridges, Maj Kullada Pichakron¹, Capt Matt Chauviere, Capt Geoffrey Douglas

Background: Blood transfusion is an essential treatment for hemorrhagic shock. The US military has stockpiled over 60,000 units of frozen red blood cells (RBCs) to preclude supply shortages. Until the recent war in Afghanistan, frozen blood had not been used in a combat theater since the Vietnam War. We evaluated the safety and efficacy of frozen RBC transfusion. **Methods:** We retrospectively reviewed a database of 56 patients transfused frozen RBCs in two hospitals in Afghanistan. The occurrence of acute transfusion reactions was documented for each patient. 34 patients had pre and post-transfusion blood counts available. **Results:** No transfusion reactions occurred. There was an increase in recipients' post-transfusion hemoglobin of 1.5 ± 1.4 g/dL, (95% CI= 1.1 – 1.9) per unit transfused. **Conclusions:** Frozen RBC transfusion is safe and effective. Frozen blood will be essential for meeting unpredictable demands in times of short supply.

24. Hydrogen Fluoride inhalation injury from a fire suppression system

USAF / 60 MDG

Department of Surgery, David Grant USAF Medical Center, Travis, AFB
Lt Col Dustin Zierold, Capt Matthew Chauviere

Automatic fire suppression systems use hydrofluorocarbons (HFC) to chemically extinguish fires. At high temperatures, HFC can release hydrogen fluoride, a toxic and potentially lethal gas. We report the deaths of three US military personnel at Bagram Air Base from acute respiratory failure after the fire suppression system in their vehicle received a direct hit from a rocket propelled grenade. Despite presenting with little to no additional signs of trauma, these individuals all died within 24 hours from hydrogen fluoride induced respiratory failure. When two patients later presented with similar symptoms after damage to their vehicle's fire suppression system, they were aggressively treated with nebulized calcium and positive pressure ventilation. Both survived. With the ubiquity of HFC-containing fire suppression systems in military vehicles, cases of hydrogen fluoride inhalation injury may become more common. The ability to rapidly diagnose and appropriately treat this injury will have a substantial impact on patients' survival.

25. Design of an In Vitro Chamber to Study Realistic Occupational Exposure of Engineered Nanomaterials to Biological Systems

711 HPW/RHPBA
Ms. Christin Grabinski

Many studies have been conducted to address the toxicity of engineered nanomaterials (ENMs). However, current methods require dispersion of ENMs in biological media before administration to a biological system, which does not mimic realistic exposure and often yields inconclusive results. The objective of this study is to design an in vitro chamber to mimic realistic inhalation exposure by delivering well-characterized ENMs dispersed in the gas phase to cells and tissues. ENMs were dispersed in the gas phase using electrospray technology, and a commercially available horizontal diffusion chamber was modified using machining techniques to optimize it for ENM exposure. The ability to apply an alternating electric field for enhancing ENM deposition was included in the design. A continuous flow of fresh media was provided to the basal side of cells grown on a porous membrane, and a heat plate was used to maintain the internal temperature of the system at 37°C. Initial studies were carried out to determine whether cells could be sustained in this system without ENM exposure by comparing the proliferation and morphology of cells grown on the membrane support under traditional conditions (submerged in media and incubated at 5% CO₂, 37°C) versus cells exposed to air flow from the Electrospray (95% air, 5% CO₂) for 0.5 - 240 minutes. Studies were also carried out to evaluate the effect of electric field on ENM deposition. The results of these studies allow for optimized ENM delivery to cells for realistic in vitro inhalation toxicology investigation.

26. PbS, PbSe, and Other Semiconductor Nanocrystals for Blocking Laser Radiation

University of Illinois at Chicago
Professor Luke Hanley

Semiconductor nanocrystals and materials derived from them show promise for applications, such as laser eye protection (LEP), that require blocking of pulsed laser radiation while allowing passage of lower intensity light. Oleic acid capped lead sulfide (PbS) and lead selenide (PbSe) nanocrystals were synthesized, then subjected to a post-synthesis washing in a 1:1 ethanol/hexane solution. Transmission electron microscopy of the oleic acid capped PbSe and PbS nanocrystals showed various shapes, narrow size distribution and an average sizes of less than 20 nm. The relationship of third order nonlinear optical properties to nanocrystal surface chemistry as affected by washing was analyzed using nanosecond 532 nm Z-scan and measurement of near-IR radiative emission. The results indicated a significant change in optical nonlinearities which emerged only after the nanocrystals were washed in the ethanol/hexane mixture. However, neither size nor shape of the nanocubes were modified by the washing process, indicating that all optical differences were related to changes in surface chemistry and the formation of deep trap states. The "as grown" PbS and PbSe nanocrystals showed high emission efficiency and weak saturable absorption. After post-synthesis washing, the nanocrystals were converted to a reverse saturable absorbing and strongly scattering colloidal solutions. The fitted experimental Z-scan data for the samples after washing gave high values for the nonlinear absorption coefficient. The appearance of reverse saturable absorption in the nanocrystals was due to the presence of trap states at the nanocrystal surface which were not present in the as-grown nanocrystals that did not show similar optical nonlinearity. The promise of other semiconductor nanocrystals, beyond those of PbS and PbSe, will also be discussed for these applications.

27. Disordered Motivation Following Penetrating Head Injury in Combat Veterans

AFIT
Maj Jeffrey Lewis

Disorders of motivation (DDM) such as apathy and anhedonia (loss of motivation to seek pleasure) are known consequences of traumatic brain injury (TBI) and significantly influence outcome. To explore the neuroanatomic basis of DDM after TBI, we performed a lesion analysis using self-reported anhedonia and companion/caregiver reported apathy. Behavioral measures were the anhedonia subscale of the Beck Depression Inventory (BDI Anh) and companion/caregiver report of apathy severity on the Neuropsychiatric Inventory (NPI-A). Brain CT data from 198 and 174 participants in the Vietnam Head Injury Study were used for anhedonia and apathy analyses, respectively. MRI was not possible in this sample with high prevalence of retained metal. The right, left and bilateral ventromedial prefrontal cortices were selected for the analysis. There were no differences between lesion groups in respect to age or preinjury intelligence as measured by the Armed Forces Qualification Test. Lesions in right ventromedial prefrontal cortex were associated with greater anhedonia compared to all other regions ($p=0.037$), and lesions involving bilateral prefrontal cortices were associated with greater apathy ($p=0.046$) compared to all other regions. These results suggest separate prefrontal cortical regions, which when damaged produce experienced and witnessed loss of motivation.

28. Negotiating Approval of Human Research from the Institutional Review Board (IRB)

711 HPW/IR
Ms. Kim London

In today's high volume clinical and operational world, human subject research is a key ingredient to the development of highly effective interventions. Human subject research is regulated by federally enacted laws as well as DoD and Air Force regulations. Researchers with a working knowledge of these regulations are much better equipped to navigate the regulatory environment than those without. Furthermore, having an understanding of current "hot" regulatory issues facilitates researcher-IRB discussions. This poster presentation will briefly outline the conceptual underpinning of today's regulations --- respect for persons, beneficence, and justice --- and the various types of research review --- non-human use, exempt, expedited, and convened board. At its core, the poster will present a number of IRB issues that consistently perplex researchers. Specific topics will include: informed consent in patients that are unconscious (eg, head-injured patients, ventilator-dependent patients, etc); privacy protection (eg, mining of large epidemiological databases, development of clinical biospecimen repositories, etc); genetic research (eg, to support clinical policy making, to detect training prowess, etc); internet/cyber research (eg, to track disease progression, to track cultural trends, etc); international research (eg, to assess collaborative operational toxicologic risks, to determine operational consequences of fatigue, etc); and performance enhancing technologies research (eg, transcranial magnetic stimulation, transcranial direct current stimulation, etc). Having reviewed the poster, the attendee should understand the basis for regulatory review, the types of review, and some of the more vexing issues associated with cutting-edge research.

Co-authors: Col William P. Butler & 1Lt Patricia C. Brennans

29. Analysis of Type 2 Diabetes-associated single nucleotide polymorphisms in a military population

Eagle Applied Sciences, LLC
Dr. Jon McDonald

BACKGROUND: In spite of high fitness standards, the incidence of type 2 diabetes (T2D) in the US military is similar to that of the civilian population. Several genome-wide association studies have identified T2D susceptibility loci, and this study's objective was to evaluate the prevalence of risk-associated genetic factors within active duty, retired military and military dependent populations. **METHODS:** Single-nucleotide polymorphisms (SNPs) in or near 17 genes were genotyped in 326 T2D patients seen at Wilford Hall Medical Center. Logistic regression analysis was used to match cases and controls on age, gender, height and weight, and was then performed in stepwise methodology to identify associated variables with the disease. Effect size and power analysis determined if the differences were both meaningful and reliable. **RESULTS:** 6 SNPs in or near genes HHEX, JAZF1, PPARG, SLC30A8, TCF7L2, and WFS1 were identified as significant predictors. Effect size and power analysis demonstrated that while the model was well powered at $>.80$, the effect size was 0.07. It was estimated that 565 samples would determine if the current effect size was reflective of the magnitude of differences that would persist between the two populations. These samples have been collected and are pending genotyping.

CONCLUSIONS: These data support a T2D genetic susceptibility within a population subset of the US military. These data can be utilized to assess risk conferring genotypes in our current and future war fighters, identifying individuals that may benefit from healthy lifestyle modifications and disease management programs prior to T2D onset.

30. Identification of adenoviral serotypes in basic military trainees at Lackland Air Force Base

Eagle Applied Sciences, LLC
Dr. Jon McDonald

BACKGROUND: Of the seven species (A to G) of human adenoviruses (HAdVs), species B, C, and E can cause febrile respiratory illness (FRI). While species C usually affects pediatric populations, species B and E are responsible for the majority FRI among basic military trainees (BMTs). Annually, HAdVs cause 22,000 FRI cases in BMTs requiring medical attention. These cause training schedule delays costing the US government \$40M annually. **METHODS:** BMTs at Lackland AFB (LAFB) with FRI symptoms volunteered nasal washes, throat swabs, and standardized questionnaires under IRB-approved protocols. Samples were tested with a panel of quantitative PCR assays including ones to detect HAdV serotypes B3, E4, B7, B11, B14, and B21.

RESULTS: 1514 of 2138 FRI cases typed between May 2007 and March 2011 were HAdV positive (71%). Two predominant subtypes observed, and their outbreaks overlapped: 404 cases of HAdV-B14 occurred between May 2007 and July 2009, while 983 cases of HAdV-E4 occurred between January 2009 and March 2011. Additionally, 94 cases of HAdV-B7 were also observed between October 2008 and May 2009. Similarly, small occurrences of HAdV-B3 were observed, with 12 cases identified between November 2008 and February 2009, 7 cases in June 2010, and 9 cases in January and February 2011. **CONCLUSIONS:** The pathogens causing most FRI cases in BMTs at LAFB are HAdVs. The recently FDA approved adenovirus vaccine is likely to change the respiratory pathogen landscape for the BMT. It is essential to characterize respiratory infections so that the epidemiology of respiratory outbreaks is known.

31. Obstructive Sleep Apnea Waiver Outcomes at the Aeromedical Consultation Service (ACS)

711 HPW/USAFSAM-FEC
TSgt Tonya Merriweather

Aircrew and special duty personnel are often referred to the Aeromedical Consultation Service (ACS) for thorough evaluations due to disqualifying medical or psychiatric conditions to obtain a waiver. Obstructive sleep apnea (OSA) is becoming a frequent condition evaluated at the ACS and AF wide; it is a major cause of geographic restrictions (e.g., assignment limitation codes). The condition is disqualifying due to the effects it can have on alertness and cognition. In more severe cases it can present with psychological or medical manifestations. These members, once diagnosed, are disqualified from flying until their condition and symptoms are controlled. The ACS has tracked several variables related to OSA that can determine whether a waiver is granted or not (i.e., neurocognitive deficits, oral orthotic/continuous positive airway pressure device compliance, symptoms, etc.). The purpose of this study is look at the overall waiver rates for OSA and determine broadly what went wrong for members unable to obtain a waiver on their first attempt. We will outline the factors leading to a successful waiver on second (+) attempts. Patient data collected on aviator/special duty personnel with a diagnosis of sleep apnea from 1999-2007 were reviewed. One hundred eighteen aviators/special duty personnel received one or more evaluations at the ACS. Control of symptoms, control of condition on sleep study, and compliance were all factors critical to obtaining a waiver. Flight surgeons should ensure that OSA is rigorously treated and risk factors for progression followed to ensure a successful waiver.

32. SAS Enterprise Business Intelligence Platform

AF Healthcare Informatics Division,
SG6H
Mr. Agustin Moreno, Epidemiologist

With the inevitable demand of increased medical information delivery and reporting, the Air Force Healthcare Informatics Division (HID) turned to the SAS Enterprise Business Intelligence (EBI) platform as a solution to help meet the demand of generating more detailed and accurate reports at a quicker pace and change current processes to transition to a more customer oriented data infrastructure. A wide variety of reports and information are generated from the HID that range from one-time data requests, to reoccurring, to the most complicated, which generally require in-depth research into multiple data sources and advanced statistical analysis. Current processes for information delivery and reporting requires tasks being performed over and over again on similar data and distributed in many formats, which in turn reduces efficiency of resource utilization. To help standardize data reporting, future methods for information delivery will transition a majority of reports through SAS information delivery portals. These portals will allow customers to extract data without programming background, have access to dashboards of quality measures, perform statistical analysis through friendly pull-down menus on the same platform as the source data, and create customizable reports that utilize well-designed data marts. The SAS BI solution is a powerful software package that will aid in data acquisition and accessibility to the customer, who ultimately will benefit from the self-service reporting and analysis capabilities it provides and the unlimited information it produces.

33. Operational Test of Quick Erect Tentage

AFMSA/SG5T

Major/Chief, AE Eval Prog. Charles Morris

The Air Force Medical Evaluation Support Activity (AFMESA) is the only USAF medical organization that is dedicated to operational testing of emerging medical and dental technologies, including applicable IM/IT systems. The organization helps to eliminate and report possible deficiencies and to ensure that only effective, suitable and survivable systems are fielded. AFMESA is currently involved in a number of projects including the ongoing Utilis tent system evaluation that is a component of the forthcoming Expeditionary Medical Support (EMEDS) Health Response Team (HRT) UTC.

The growing need for a tentage system that erects in a short time period by a minimum number of personnel emerged after recent natural disasters in Haiti and Chile. The current Alaskan system required a much larger footprint slowing insertion into locations with damaged infrastructure. Concerns were raised about weatherability of the system in temperate climates. An EMEDS team was selected by ACC to provide feedback to the test team on the space available for medical equipment/personnel, human factors, training, maintainability, reliability, transportability, compatibility and safety. AFMESA has been actively involved in the testing of the Utilis tentage system at the AFMESA Fort Detrick site, at Travis AFB and during the Fuerzas Aliadas Humanitarias (FA-HUM 2011) exercise in Trinidad and Tobago. Operational testing has shown that a fast-build small footprint tentage system like the Utilis supports the user but also highlighted some areas for improvement. Direct involvement by AFMESA personnel has resulted in numerous improvements to the durability and weather resistant nature of the system.

34. Substance Abuse Among Service Members with TBI

TMA/DCOE

Dr. Vladmir Nacev

Motor vehicle accidents (MVA) and sports injuries appear to be most frequent events associated with traumatic brain injury (TBI). Depending on which study is examined, the data have shown that anywhere from 18% to 66% of patients with TBI have a history of alcohol abuse and that about 33% to 50% of persons with TBI were intoxicated at the time of their injury. Other studies have shown that TBI patients are twice as likely to be either a significant user or abuser of drugs or alcohol. The research also suggests that young adults, ages 20-29, are prone for high-risk behaviors for traumatic brain injury (TBI) and substance abuse. Some have suggested that alcohol use may contribute to or be a consequence of TBI. Neurological deficits associated with TBI may explain the increase in substance abuse. Others have suggested that three to 10 years post injury the substance use is at 10%. Some studies have suggested that at five years post injury, patients with TBI tend to resume their prior levels of alcohol or substance use. The data is clear, however, that for patients with TBI, it is in their best interest to avoid substance use and abuse. If substance abuse were perceived as a continuum, from little or no use to unhealthy use (about 68 million) to addiction (about 25 million), then the most effective approach in reducing future abuse is through prevention efforts focused on those who hardly use it and those who engage in unhealthy use of alcohol.

35. Impact of High Power Radio Frequency (RF) Radiation on Cardiac Pacemakers, A Pilot Study

59th MDOS/SG05C

Department of Cardiology, Wilford Hall Medical Center (WHMC), TX

General Dynamics, Brooks City-Base, TX and AFRL Radio Frequency Radiation Branch, Brooks City-Base, TX

Javed M. Nasir, MD (1), Ronald L. Seaman, PhD, Alayna Amato, MS, Kevin Mylacraine, AAS, Noel D. Montgomery, MS, Samuel Jones, MD, MPH.

INTRODUCTION: Electromagnetic interference (EMI) on pacemaker function remains a significant concern, especially as EMI sources proliferate. While pacemaker response to RF radiation sources near the IEEE 95.1 standard maximum permissible limits have been tested, there is little published data on the effects to pacemakers at much higher exposure levels. **EXPERIMENTAL DESIGN:** During in vitro testing, five functional, explanted pacemakers were exposed to high power RF radiation at 2.06 GHz emitted from an open-ended waveguide. The devices were programmed to maximize sensitivity with a unipolar lead configuration at 0.25 mV.

RESULTS: The five pacemakers underwent a total of 59 exposures to RF radiation of varying duration and wattage, of which 57 exposures were available for this analysis. During exposure to high power RF radiation, noticeable reactions occurred in 35% of all tests, and were evident in four out of five pacemakers. Inhibition for >3 seconds was seen in five tests.

DISCUSSION: Pacemakers from four different companies were tested, with four out of five pacemakers showing effects. Caution regarding EMI on pacemaker function is necessary as newer and higher power RF sources are created. The effects seen in this study demonstrated potential for clinically significant EMI.

CONCLUSION: This study shows that high power RF radiation has the potential to interfere with normal pacemaker function in a clinically

significant manner. Further investigation into the possibility of EMI from high power RF is needed.

36. Informing an AFMS Diabetes Care Strategy

AFMOA

Colonel James Neville

Background: Standard Healthcare Effectiveness Data and Information Set (HEDIS) measures of diabetes care show both variability and performance below expectations within the AFMS. We undertook a comprehensive review of system-wide AFMS diabetes care processes to determine the need for an AFMS-level Diabetes Care Strategy. **Methods:** We evaluated care processes by considering diabetes care for three distinct patient categories: those seen by their primary care manager (PCM) at any one time in the previous year, those seen within the Medical Treatment Facility (MTF) but never by the PCM, and those not seen in the direct care system at all. **Findings:** for the 12 month period ending 1 April 2010, 47,321 diabetics were enrolled at AFMS MTFs. Overall AFMS performance for annual Hgb A1c screening was 83.6% (<50th percentile) (MTF range: 50% to 95.5%), whereas 94.1% of patients seen by their PCM during the preceding year had an annual Hgb A1c screen (>90th percentile). A similar pattern was demonstrated for other HEDIS measures assessing lipid and glycemic control. **Discussion:** Results demonstrate a strong association between being seen by the PCM and high levels of diabetes care as assessed by standard HEDIS measures. The results infer that PCM teams are performing at a level above the 90th percentile nationally when they actually see the patient, a level of performance not reflected in data reported for the AFMS overall. Improvement in overall AFMS diabetes care performance can be expected through efforts to drive enrolled patients to be seen by their PCM.

37. A Comparative Analysis of Real-Time PCR Reagents for Field use

United States Air Force Academy
Department of Biology, United States Air Force

Craig D Nowadly, Melanie LM Grogger,
Daniel H. Atchley, Donald V Veverka

During the last decade advances in technology and equipment have helped transition molecular-based research from the laboratory to the field. However, field use of molecular reagents presents a couple obstacles: most require refrigeration, and those that are ambient-temperature stable do not offer the end-user the ability to quickly, easily, and economically tailor them to their unique medical or environmental application. Our research focuses on addressing this gap by examining real-time PCR (q-PCR) dyes (a backbone of molecular testing) for their utility in the field environment. Lyophilized primers (another key ingredient of qPCR) are inexpensive and readily available, and can paired with appropriate qPCR dyes to meet a plethora of field research/diagnostic needs. To this end, we have begun preliminary head-to-head testing of GreenMaster Lyophilisate (Jena Bioscience, Jena, Germany), a new commercially available lyophilized qPCR product, to our experimental qPCR blend of GE Ready-to-Go beads (GE Healthcare, Pittsburgh, PA) mixed with one of two room temperature stable qPCR fluorescent dyes - GelGreen and EvaGreen (Biotium, Hayward, CA). Our initial data suggest the EvaGreen dye concoction outperforms GreenMaster Lyophilisate and another experimental blend containing GelGreen in total fluorescence signal produced. If confirmed, this new experimental blend will offer field researchers a field-friendly reagent to perform user-defined molecular testing outside the laboratory.

38. AF Web-Based Health Assessment and its application to health promotion and health services research

USAF AFMSA SG6H
Ms. Laura Racster

In accordance with Health Affairs Policy Memo, 06-006 and Air Force (AF) Instruction 44-170, an annual Preventive Health Assessment (PHA) is required for each Active Duty, Guard and Reserve Airmen. The intent of the PHA program is to provide evidence-based, cost-effective preventive health services to Airmen to maximize their health and readiness postures. Policy directs the use of a self-report health status tool. The AF uses the AF Web-Based Health Assessment (AFWebHA) which includes a DoD developed question set. The AFWebHA only includes questions that have effective interventions available for positive responses in areas such as; depression, alcohol use, activity limitation, tobacco use, injury prevention, PTSD, sleep and sleep habits, anger and eating disorders. Since beta test began in late 2005, over 1,100,000 sessions have been completed. The AFWebHA provides military treatment facility (MTF) specific trend reports and question/response percentages with patient information to the MTF administrator and the provider, nurse and technician health care team. The Health Care Informatics Branch (HID) captures all AFWebHA data in a cumulative database for use in analysis. HID has the capability to match AFWebHA data to other AF and DoD-wide databases such as AF personnel records, pre / post deployment health assessments and healthcare encounter data to answer a variety of population health research and surveillance questions. AFWebHA data has been used in studies such as 'association between physical activity and fitness test scores', 'appropriate follow-up care for service members suffering sleep apnea' and 'trend of overweight and obesity over time'

39. Improved Immunohistochemical Method For The Visualization Of Tissue Damage Caused By Laser Exposure

University of Illinois at Chicago
Professor James A. Radosevich, Ph.D.

Tissue damage caused by lasers has been traditionally evaluated using H&E staining. We hypothesized that there was more tissue damage than was observed using H&E staining. We therefore developed a method which would be able to visualize live and dead cells in tissue. A vibrating microtome was used to cut live tissue and the resulting sections were stained with a yellow metabolic dye (MTT). Live cells convert MTT to an intense purple color, whereas dead cells remain yellow. While this method is a significant improvement over H&E, it does require a specially trained histologist, specialized equipment (vibrating microtome), and has a limited working time (about 10 hours *ex vivo*). Herein, we set out to produce a method that would eliminate these constraints. We proposed to use formalin fixed-paraffin embedded tissues to eliminate the need for special training and equipment. We reasoned that, like the antigen retrieval method (which uses heat to relax protein structures that refold to reconstitute antigen binding sites), that laser exposure would result in the loss of antigen binding sites due to antigen destruction. With "off the shelf" antibodies, we used their natural cross reactivity to stain the tissue we were studying (swine model) even though these antibodies were directed at proteins of other species. This approach not only provided proof of principle, but also documents that this method could be used for any tissue source, given the right antibody is identified. We also identified commercially produced, anti-swine anti-sera which worked well in our (swine) system.

40. Surveillance of Disease/non-battle Orthopedic Injury among Members of the Active Component, U.S. Armed Forces

59th MDW/ ST, AETC
Dr. Rosemarie Ramos

Musculoskeletal disease and non-battle injuries (D/NBI) pose a threat to readiness at the unit and individual levels within the US Military. However, a surveillance program that monitors the trends of such injuries or assesses the efficacy of surgery to treat such injuries (within the context of return to duty) does not exist. In 2004, the Society of Military Orthopedic Surgeons (SOMOS) sought to address this void in knowledge at the health care delivery and policy-making level within the US Department of Defense. In support of this commitment by the SOMOS, the Air Force Surgeon General advocated for the development of a surveillance program under the guidance of senior active-duty orthopedic surgeons. The first task was to determine the demographic trends of musculoskeletal D/NBI among members of the active component within the US Military. From 2004 – 2010, approximately 150,000 surgical procedures were performed to treat common knee and shoulder injuries that were not a result of battle. When examining this trend by service, we found that procedures occurred with highest frequency in the Army (48%) followed by the Air Force (21%), Navy (19%) and Marines (11%). Although males comprised a sizable proportion of the selected surgeries (89%) when compared to females (11%), it is not clear if females are less prone to injury requiring surgery or if health-seeking behavior among females has reduced the long-term risk for surgical treatment. This is the first attempt to characterize the prevalence of musculoskeletal D/NBI that has required surgical treatment.

41. Comparison of Airway Control Methods and Ventilation Success with a Automatic Resuscitator

711 HPW/USAFSAM-ETS
Chief MSgt Dario Rodriquez

Mechanical ventilation in the far-forward environment is difficult owing to logistics, training, and environmental conditions. We evaluated the ability of physicians, respiratory therapists, and nurses to provide ventilatory support to a simulated patient using attended ventilation with a face mask, unattended ventilation with the face mask strapped to the models face, and ventilation using a supraglottic airway (King LT). All three methods were performed using a SAVe automatic resuscitator with a set tidal volume of 600 ml and respiratory rate of 10 breaths per minute. No oxygen was provided. The simulator consisted of a head and upper torso with anatomically correct upper airway structures, trachea, esophagus and lung which also measured the delivered tidal volume, respiratory rate, inspiratory flow, and airway pressures. We also recorded any volume entering the stomach. Each volunteer used each airway control method to provide ventilation for 5-10 minutes in random order. The average tidal volume delivered to the lungs, respiratory rate and airway pressures represent at least five consecutive minutes of ventilation. Success of the technique was judged as a mean delivered tidal volume of > 500 ml. Data for each method and the success rate will be provided.

42. Surveillance Performance of the Impact 731 Ventilator at Altitude

711 HPW/USAFSAM-ETS
Chief MSgt Dario Rodriquez

Purpose: Changes in barometric pressure at altitude alter the tidal volume (VT) of portable ventilators. We evaluated the effects of altitude on performance of the Impact 731 ventilator (Impact Instrumentation).

Methods: The ventilator was connected to a training test lung with a compliance of 0.04 L/cm H₂O and resistance of 5 cm H₂O/L/s. A pneumotach measured airway pressure, volume, and flow. The ventilator was tested at sea level, 4000, 8000, 12,000 and 18,000 ft of simulated altitude corresponding to barometric pressures of 760, 656, 564, 483 and 380 mmHg. The ventilator was operated at an inspired oxygen fraction (FIO₂) of 0.21 at VT of 300 mL, 500 mL, and 1000 mL. We also set the ventilator to the pressure control mode at a pressure of 20 cm H₂O. Data are presented as the mean ± standard deviation of 10 consecutive breaths at each condition. Up to 8000 ft at all volumes, VT remained within 10% of set. At lower VT (300, 500) at 12,000 and 18,000 ft, VT was within 13%. Accounting for compressible volume of the circuit (1.7 mL/cm H₂O), the delivered VT was always within 10% of set. The device compensates VT for altitude across the range tested.

43. The Integration of a Family-Centered Preventive Intervention Into Air Force Medical Systems of Care

UCLA

Dr William Saltzman and Maj Eric Flake,
MD, USAF MC

The FOCUS Program (Families OverComing Under Stress) developed by a team from the UCLA-Harvard Schools of Medicine, is a brief family centered preventive intervention developed to promote resiliency and mitigate the impact of combat stress on military children and parents. Over the last three years over 200,000 children and parents from 21 Air Force, Navy, Marine and Army installations have participated in the program. This poster will focus on the innovative partnership with Air Force primary care practitioners at Keesler AFB that enabled this program to be integrated into existing systems of care, and the outcomes afforded the families participating in the program.

Despite the brevity of the intervention (8 sessions) program evaluation demonstrates positive impact with children reporting increased use of positive coping strategies (problem solving ($p = .0001$) and emotional regulation ($p = .005$)) and prosocial behaviors ($p = .01$), as well as reductions in conduct problems ($p < .0001$), and emotional symptoms ($p = .001$). Active duty and non-active duty parents reported decreased depression ($p < .01$) and anxiety ($p = .002$). Family functioning improved (problem solving, communication, roles, affective responsiveness, behavior control) ($p < .0001$).

As a targeted public health prevention program utilizing a rigorous and innovative implementation model, FOCUS provides an example of a successful adaption of an evidence-based intervention for Air Force culture, integrating with line programs and command, and achieving customization for unique needs of families during and after wartime deployments. Program evaluation demonstrates a high level of satisfaction, perception of positive change, and

improved psychological symptoms and family functioning for parents and children.

44. Silver Nanowires Induced Inflammation in an In Vitro Human Alveolar Lung Model

711 HPW/RHPBA

Ms. Nicole Schaeublin

The goal of this study was to evaluate the biological response following inhalation exposure to silver nanowires (Ag-NWs). Nanomaterials have been shown to penetrate deep into the alveolar regions of the lung, so we used a human alveolar lung co-culture model previously established in our lab as our model for inhalation exposure. The Ag-NWs were synthesized by nanoComposix and were 4 and 20 μm in length, with a similar diameter of ~ 90 nm. Changes in cellular morphology and the cellular interaction of the Ag-NWs with the cells was assessed using ultra-resolution microscopy after a 24 h exposure to 200 ng/ml of the Ag-NWs. The cell morphology and interaction of the Ag-NWs demonstrated that both lengths of Ag-NWs were interacting with the cells, but normal morphology indicated that they were not toxic. In addition, the co-cultures were exposed to Ag-NWs (concentrations ranging from 0-200 ng/ml) and cell viability was assessed using luminescence to evaluate mitochondrial function. Our viability assays indicated that both Ag-NWs did not alter cell viability and that there was no toxicity. In addition, inflammatory responses were evaluated using ELISA assays to determine the secretion of 12 different cytokines. Of the cytokines evaluated, the Ag-NWs demonstrated an increase in secretion of IL-6 and a decrease in IL-10 indicating that the Ag-NWs caused inflammation. Therefore, while the Ag-NWs were not toxic to the cells, they did cause irritation and triggered an inflammatory response.

45. Diabetes Knowledge and Perceptions in Military Members at Travis AFB

60 MDG/SGSE

Mr. Eduardo Sevilla

Background: Diabetes is a public health challenge in the U.S. and also impacts the overall health and readiness of military members. Knowledge and perceptions about diabetes among military members is important to understand to screen and effectively prevent the development of diabetes.

Methods: Exempt determination was received for an anonymous, 11-question survey. Descriptive statistics and non-parametric tests were used to evaluate differences in knowledge based on age (of the subject) and if the subject "knew a diabetic."

Results: A total of 154 surveys were completed by military members on Travis AFB. A majority of respondents were 20-29 years of age and senior enlisted (E5-E9). 69% (N=XX) knew someone with the diagnosis of diabetes and overall knowledge of diabetes ranged from 62% to 93%. The mean total diabetes knowledge score was 3.18 (on a scale of 0 to 4). No significant difference in total diabetes knowledge was noted for subjects who knew someone with diabetes compared to those that did not ($p=0.39$). Individuals 30-39 years of age had the highest knowledge scores compared to those that were younger or older ($p=0.025$).

Conclusions: Overall knowledge of diabetes was fairly high for this sample of military members although more than 25% incorrectly believed that a diabetes diagnosis was a service disqualifier. The results of this study suggest there is a need for continued education. This is particularly important for those military members at risk for developing diabetes who may avoid recommended screening and/or follow-up for fear of service disqualification. NOTE: The views expressed in the document are those of the author, and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the U.S. Government.

46. Motor Skills Training as a Neuroprotective Strategy

711 HPW/RHPA

1st Lt Kathryn Sidrow

Motor skills training (MST) is a form of skilled exercise that involves coordination, balance, concentration, and learning components. Neurological benefits of MST include cerebellum angiogenesis, synaptogenesis, motor cortex strengthening and reorganization, and hippocampal neurogenesis. Previous research in animal models has shown that MST following brain injury can successfully reduce functional deficits in motor function, learning and spatial memory. The current research examined the neuroenhancing benefit of MST in healthy animals. Adult male rats were trained for four weeks on an elevated obstacle course consisting of ladders, ropes, chains, parallel bars, and balance beams. Following training, animals were behaviorally tested to assess memory, anxiety, and exploratory behavior. MST significantly improved performance on tasks of spatial memory and reduced anxiety like behavior. Further research is necessary to determine if skilled exercise in humans could provide performance enhancing cognitive benefits for Airmen, especially those exposed to significant operational stress in deployed environments. Airmen already participate in physical fitness regimens that consist of aerobics and calisthenics which prepare them physically for deployment. If skilled exercise proves effective in humans, it could be incorporated into these physical training sessions to improve resilience and cognitive performance at minimal cost.

47. Motor Report of cognitive problems in OIF/OEF/OND Veterans and Service Members exposed to blast and/or head trauma and improved function after cognitive rehabilitation

Durham VAMC
Dr. Carol Smith Hammond, Ph.D.

Veterans and Service Members seeking care in the Veterans Affairs Healthcare System are screened for exposure to blast or blunt head trauma. Almost 40% of those with traumatic brain injury (TBI) are reported to also present with post traumatic stress disorder and depression, both of which may have secondary symptoms of cognitive problems. Veterans with a positive screen (n=306) were interviewed and evaluated with objective neuropsychological tests at the Durham VAMC by Speech Language Pathologists. Results indicated, compared to function prior to deployment, almost half report problems with reading (49%) and writing (45%). Over a quarter of those evaluated were unemployed (26%) and over a third report problems at work (34%). Sixty percent have trouble remembering daily tasks and procedures and 79% have trouble multi-tasking. Eighty-five percent have difficulty expressing themselves while speaking and 90% are easily distracted and have trouble concentrating. Results of objective cognitive testing indicated almost 50% were below expected performance for immediate and delayed memory and attention subtests. Patient report showed a significant improvement when cognitive rehabilitation was initiated compared to pretreatment report. Issue of cognitive prosthetic devices (personal digital assistant PDA and/or memory watch) or training the patient in use of their personal smartphone was a key component of the treatment. Veterans and service members were better able to remember to take medications (p=.0001), keep appointments (p=.0001), remember what other tell them to do (p=.0001), remember what they went to the store to get (p=.0001) and cook without burning food (p=.02).

48. The Evaluation of the Meso Scale PR2 for Toxin and Pathogen Detection

711 HPW/USAFSAM-PHT
Clarise Rivera Starr, Ph.D.; Elizabeth Escamilla, M.S., Robert Alcorta, B.S.; Linda Armstrong, M.S.; Roel Escobar, B.S.; Manuel Caballero, B.S.; Barry Johnson, B.S.; Elia Villazana-Espinoza, M.S.; and David L. Maserang, Ph.D

The M1M toxin analyzer is currently being phased out; therefore, a new technology, the Meso Scale Discovery Sector PR2 Model 1800 and 1900, was evaluated to assess toxin and pathogen detection capabilities. Five different assay plates that were designed and supplied by Meso Scale were analyzed: simulant, toxin, foodborne pathogen, upper respiratory infection panel, and a flu (H1/H3/H5) panel. Limits of detection (LODs) in phosphate buffered saline and in various food and clinical matrices were evaluated, as well as specificity and comparison of the automated 1900 version with the manual 1800 version. Overall, the toxin assays for Staphylococcal enterotoxin B and Clostridium botulinum type A and the simulant ovalbumin were very sensitive (LOD = 5-50 pg/mL). Pathogen assays worked well depending on the assays; however, MS2, Salmonella, Shigella, and Influenza A H1 subtype did not perform well, which may be attributed to the antibody used. Overall, with some software improvements, this system may be a potential replacement for the M1M.

Distribution Statement A: Approved for public release; distribution is unlimited. Case Number: 88ABW-2011-2029, 18 Apr 2011 cost.

49. Radiographic Diagnosis of Traumatic Brachial Plexus Injury

59th Radiology SQ, Lackland AFB
Capt Baxter Tharin, Radiology Resident

The cause of traumatic brachial plexus injury in adults includes penetrating wounds and blunt force mechanisms in the form of direct impact or traction injury. Military members are susceptible to these conditions in the training and deployed environments. Associated morbidity from damage to the brachial plexus, including deafferentation pain and significant loss of function, can be mitigated by early recognition of injury and a multidisciplinary approach to treatment.

Assessment of the nerve roots, where injury typically occurs, as well as the more distal components of the plexus is essential since the treatment approach depends on the location and type of brachial plexus damage. Appropriate diagnosis will determine conservative management or the necessity for early versus delayed surgical intervention.

Accurate identification of brachial plexus injuries by imaging will afford service members and veterans the best opportunity for appropriate treatment. Using cases reviewed at San Antonio Military Medical Center (SAMMC), the objective of this presentation is to describe key anatomy, demonstrate relevant imaging findings in the acute and chronic settings, and provide a practical approach for the radiographic diagnosis of traumatic brachial plexus injury.

50. A Comparison of U.S. Air Force Pilot Psychological Baseline Information to Safety Outcomes: 2001-2010

711 HPW/USAFSAM-FEER
LtCol David Trant

The purpose of this study is to determine whether specific personality traits are predictive of human error in USAF mishaps and whether these traits are also predictive of pilot error in remotely piloted aircraft (RPA). This study will update a previous study (King, Orme, & Retzlaff, 2001) that looked at 347 aviation mishaps from 1994-2000. They examined the six variables related to conscientiousness from the NEO-PI-R (a psychological personality inventory that assesses five personality factors that are felt to encompass all aspects of personality) and whether these characteristics were found to a strong degree at baseline during pre-pilot medical flight screening (MFS) in those pilots who had subsequently been found causal in a mishap. That study found that those scoring higher on competence and dutifulness were more likely than those scoring low on the scale to have a pilot- error-related mishap.

The Air Force Safety Automated System (AFSAS) database will be searched for aviation mishaps occurring during the study period of 2001-2010. The resulting subset will be sorted by aircraft type and then separated into pilot-causal and pilot-not-causal groups. Social Security Numbers gleaned from the AFSAS database will be used to query the MFS database at the Aeromedical Consultation Service to gather pre-pilot personality testing data that have already been archived. This spreadsheet, scrubbed of any identifying information, will be used for epidemiological analysis to study differences between personality traits in pilots found causal in aviation mishaps and those found not causal. Our goal is to analyze the population of USAF Flying Class I/IA/II/IIU pilots in terms of standard personality characteristics measured with the NEO-PI-R and the association of those personality characteristics with human-error-induced aircraft mishaps. This information could influence USAF flying selection policy and drive policy changes.

51. Career Impact and Referral Patterns: Army Mental Health Treatment in the Combat Theater

779 Medical Group, Joint Base Andrews, USAF
Capt Coleen Varga & Capt Spencer Clayton

This study examined the relationships between referral source, career impacts, and other relevant variables among soldiers seeking mental health intervention in a deployed setting. Data was drawn from mental health records of 1,640 Army service members (Active Duty, activated Guard and Reserve) who presented for outpatient mental health services while deployed in Afghanistan during a one-year period. A number of variables including age, gender, rank, marital status, number of prior deployments, history of mental health treatment, and reason for referral were examined across referral sources (e.g., self-referred, supervisor referred, or commander-directed) to determine differences in diagnosis, recommendation, and career impact. Results suggested differences across variables, most notably self-referrals were significantly more likely to be kept confidential and less likely to have career impacting recommendations made. Specifically, 82% of self referrals resulted in no contact made with the member's unit or command, compared to 55% of supervisor referrals. Of the self-referred Soldiers, 12 % had potentially career impacting recommendations made to command, compared to 26% of supervisor referred and 55% of command directed referred members. Overall, greater than 80% of members were returned to duty with no limits and 62% were given either no diagnosis or a diagnosis of Adjustment Disorder or Insomnia. These findings indicate that seeking psychological services is much less likely to result in career impacts when self initiated. Given the significant concerns about career impacts among many members in need of psychological services, these findings should be incorporated in information campaigns to promote help seeking.

52. Mental health perceptions and seeking treatment: A survey study of deployed soldiers in Iraq

METC (382 TRS)
Maj Rosanne Visco, Ph.D.

Background: According to the Joining Forces America report (2008) almost two-thirds of service members believe that their peers are very or somewhat unlikely to ask for professional help if they are dealing with issues like depression, post-combat stress, or family adjustment. **Purpose:** Determine how soldiers are rating their level of psychological distress and willingness to accept help. It also explored what soldiers perceived as barriers to receiving treatment and the types of resources they were willing to use. **METHODS:** This retrospective study consisted of data obtained from 1200 soldiers who completed a Unit Behavioral Health Needs Assessment Survey (UBHNAS) during a yearlong deployment to Iraq. Microsoft access analysis was performed to determine valid percentages for level of distress and desire for services, mental health perceptions and barriers, and types of resources.

Results: Of the 1200 records reviewed, 45.2% screened positive for endorsing moderate and/or severe stress and of those soldiers only 14% desired help. Top perceptions were peers would have less confidence in them (30%), leadership might treat them differently (33%) and they would be seen as weak (31%). Top barriers were that it was difficult to get off work (26%), that the visit would not be confidential (25%) and that it was difficult to schedule an appointment (18.5%). Soldiers reported using military chaplains, military medical providers, and battle buddies as their primary sources of help.

Conclusions: Soldiers continue to remain skeptical about mental health especially with types of resources available and barriers. Although the Army has instituted many programs in order to facilitate seeking mental health treatment, the issue of stigma and barriers to care continues to be problematic especially when compared to 2005 data from Afghanistan. Strategies toward decreasing barriers to care need to remain focused on ways mental health

services can meet the needs of the soldier in garrison or combat.

53. Post Traumatic Stress Disorder - War Exposure

AFMSA/SG6H
Ctr Sandy Walker

The correlation between war exposure and post-traumatic stress disorder (PTSD) has been investigated in the past. Typically, risk factors, prevalence and epidemiological research are requested for airmen that have returned from deployment. The Healthcare Informatics Division (HID) provides analyses and statistics describing the impact of the combat experience on physical and mental health to various DoD requestors. The HID uses multiple data sources to compile the data required for analysis: the Post Deployment Health Assessment (PDHA) for combat exposure, duration of deployment; the Post Deployment Health Reassessment (PDHRA) for self-reported PTSD symptoms, exposures, behavior risks; the AF Personnel database for demographics; and M2 for coded

diagnoses. For Calendar Years (CY) 2007 and 2008, quarters (Q) 1 through 3, about 15,000 service members responded to both PDHA and PDHRA in each quarter, and 10,000 in Q4 for both years. About 15,000 responded to both assessments in each of the first two quarters of CY 2009. For the time period CY07 Q1 through end of C09 Q2, demographic compositions of deployed service members did not change significantly. Prevalence of self-reported PTS symptoms within six months post deployment was roughly 1.5% for men and 2.5% for women. Prevalence of both self-reported symptoms and provider-diagnosed PTSD rates varied by demographic and deployment variables. Consistently higher PTSD rates (self-reported or diagnosed) were observed in the 'Female' and 'Enlisted' demographic sub-groups and in the 'Longer deployment duration' and 'Positive combat exposure' deployment sub-groups. 'Combat exposure' remains to be the most significant factor for PTSD rates.



Appendices



Appendix A. AFMS Medical Research Symposium Agenda



U.S. AIR FORCE

AFMS Medical Research Symposium Agenda



TUESDAY, August 2, 2011

| | | |
|---------------------|--------------------|---|
| 7:30 am - 8:30 am | Registration | |
| 8:30 am - 8:40 am | Opening Ceremonies | |
| 8:40 am - 8:50 am | Plenary Session | Brig Gen James Carroll, Commander, Air Force Medical Support Agency |
| 8:50 am - 9:15 am | | Lt Gen Bruce Green, AF Surgeon General (Tentative) |
| 9:15 am - 9:45 am | | Congressional Medal of Honor Recipient CPT(r) Paul Bucha "Combat, Leadership, and Saving Lives" |
| 9:45 am - 10:00 am | | Break |
| 10:00 am - 10:30 am | | Col Elizabeth Bridges "Air Force Medical Service Research" |
| 10:30 am - 11:00 am | | Col Christopher Robinson "DoD's DCoE for Psychological Health & Traumatic Brain Injury Initiatives" |
| 11:00 am - 11:30 am | | Col Albert Bonnema "What IT can do for the AFMS" |

Scientific Break-Out Sessions

| | | | | | |
|--------------------|--|---|--|---|--|
| 11:30 am - 1:00 pm | Lunch Break | | | | |
| | Operational Medicine (In-Garrison Care) | En-Route Care and Expeditionary Medicine | Force Health Protection | TBI and Psychological Health | Healthcare Informatics |
| 1:00 pm - 1:30 pm | The Armed Forces Institute of Regenerative Medicine: Bone and Nerve Regenerative Programs (Brig Gen Michael Yaszemski) | Effects of Aeromedical Evacuation on Intracranial Pressure (Mr. Richard Branson) | Air Emissions Characterization and Geospatial Exposure Modeling from Open Burning of Representative Military Deployed Waste (Lt Col Dirk Yamamoto) | (Pro) Decompressive Craniectomy: Lessons Learned and Clinical Experience from the DECRA Study and US Combat Operations (Dr. Kenneth Curley) | Patient-Centered Precision Care (PC2) (Dr. Ronald Miller) |
| 1:30 pm - 2:00 pm | Designing a Safer OR to ICU Hand-Off (Lt Col Broadus Atkins) | Prolonged Hypobaric During Aeromedical Evacuation and the Effects on Traumatic Brain Injury (Dr. Gary Fiskum) | Inhalation Exposure to JP-8 Jet Fuel Enhances Susceptibility to Noise Induced Hearing Loss in Rats (Dr. David Mattie) | (Con) Decompressive Craniectomy: Lessons Learned and Clinical Experience from the DECRA Study and US Combat Operations (Dr. Kenneth Curley) | Patient Health Record Implementation at Elmendorf AFB (Dr. Catherine Anderson) |

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| | | | | | |
|-------------------|--|--|---|--|--|
| 2:00 pm - 2:30 pm | Variations in the Management of Hypertension in Active Duty Airmen - JNC7 Revisited (Dr. Celan Alo) | Critical Care Air Transport Team Severe Traumatic Brain Injury Short-Term Outcomes During Flight for Operations Iraqi Freedom/Enduring Freedom Between June 2007 and August 2010 (Lt Col L. Renee Boyd) | Assessing Operationally Relevant Aspects of Nanoparticle Exposure Health Risks (Dr. Clarise Starr) | Treatment with Ethanol Decreases Systemic Inflammation and Improves Functional Recovery After Traumatic Brain Injury in Mice (Dr. Timothy Pritts) | AFMS Diabetes Care Quality Measure (Ms. Brooke Asbury) |
| 2:30 pm - 2:45 pm | Break | | | | |
| | Operational Medicine (In-Garrison Care) | En-Route Care and Expeditionary Medicine | Force Health Protection | TBI and Psychological Health | Healthcare Informatics |
| 2:45 pm - 3:15 pm | Readiness Optimization through Surgical Outcomes Surveillance (Lt Col John Tokish) | Closed Loop Control of FIO2 in Multiple Trauma Patients (Mr. Richard Branson) | Transport of Silver Nanoparticles in Saturated Porous Media: Experimental Results and Model Simulations (Capt Jason Flory) | Impacts of Frequent and Multiple Deployments on Substance Abuse by Service Members (Dr. Vladimir Nacev) | Effects of COMPASS Workflow on Documentation Quality of Family Medicine Physicians Using the Military Electronic Health Record (AHLTA) (Lt Col Charles Motsinger) |
| 3:15 pm - 3:45 pm | Prevention of Low Back Pain in the Military (POLM) cluster randomized trial (Lt Col John Childs) | Prehospital Oxygen Use in Civilian Trauma Care (Mr. Richard Branson) | Evaluation of Gold Nanomaterial Toxicity Based on Physical and Chemical Properties (Dr. Saber Hussain) | Spouse Abuse and Combat-Related Deployments in Air Force Couples (Maj Rachel Foster) | Teamwork Factors Affecting Safe Blood Product Administration (Maj Jennifer Hatzfeld) |
| 3:45 pm - 4:15 pm | Spinal Injuries Following Ejection (Lt Col Richard Blair) | Task Saturation in Critical Care Air Transport Team Advanced Training (Dr. Timothy Pritts) | Nanomaterial Hazard Identification: The Zebrafish Model for Rapid Material Testing (Maj Joseph Fisher) | The Psychometric Properties and Clinical Utility of the Air Force Post-Deployment Health Reassessment (PDHRA) for Airmen with Posttraumatic Stress Disorder (PTSD) or Depression (Maj Michael McCarthy) | Analysis of Population-Level and Large-Sample Data (Dr. Ryan Mayes) |
| 4:15 pm - 5:00 pm | Break | | | | |
| 5:00 pm - 8:00 pm | AFMS Medical Research Symposium Social and Poster Session: Poster Presenter Q&A 5:00 pm - 6:30 pm | | | | |

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WEDNESDAY, August 3, 2011

| | Operational Medicine (In-Garrison Care) | En-Route Care and Expeditionary Medicine | Force Health Protection | TBI and Psychological Health | Healthcare Informatics |
|---------------------|--|--|--|---|--|
| 8:00 am - 8:30 am | A New Paradigm for Conducting Air Force Research Air Force Diabetes and Obesity Research Working Group (Lt Col Mark True) | The Impact of Prophylactic Fasciotomy Following Porcine (Sus scrofa) Hind Limb Ischemia/Reperfusion Injury (Capt Thomas Percival) | USAF Efficient Running : An Integrated Program To Reduce Running Injury and Improve Individual Performance in USAF Fitness Assessment (Dr. Daniel Kulund) | Trends in the Early Care of Casualties with Polytrauma and Moderate or Severe TBI (Lt Col Karen O'Connell) | The research maze and the wheels of progress: How the Health Services Data Warehouse will transform the way research is done. (Lt Col David Carnahan) |
| 8:30 am - 9:00 am | Delivering a Diabetes Prevention Program in a Military Setting (Maj Lisa Strickland) | A Nursing Research System to Obtain Functional Outcomes and Provide Clinical Education Following Wartime Extremity Vascular Injury (Capt Diane Lynd) | Comparison of the 1.5 Mile Run Times at 7,200 Feet and Simulated 850 Feet in a Hyperoxic Room (Lt Col Michael Zupan) | The Traumatic Brain Injury Research Portfolio of the Army and Defense Medical Research and Development Programs: An Overview (COL Dallas Hack) | The Health Services Data Warehouse (HSDW) in Action: Focus on Patient Centered Medical Home (PCMH) (Maj Claudine Ward) |
| 9:00 am - 9:30 am | USAF Obesity Educator Program (Dr. Thomas McKnight) | Major Arterial Vascular Injuries Sustained During Combat Operations: Demographics, Outcomes, and Lessons To Be Learned from Contrasts to Civilian Counterparts (Capt Nicholay Markov) | Can a 10-minute Warm-up Reduce Musculoskeletal Injury in Air Force Academy Cadets? (Dr. Sarah De La Motte) | Update on Non-Invasive TBI Diagnostic Efforts (Dr. Douglas Gibson) | The application of Johns Hopkins Adjusted Clinical Group case-mix system in AFMS (Ms. Susan Chao) |
| 9:30 am - 9:45 am | Break | | | | |
| 9:45 am - 10:15 am | Intraosseous Infusion Rates Under High Pressure: A Cadaver Study of Anatomical Site Comparisons (Maj Joe Dubose) | Advanced Team Training for Long-Range Extracorporeal Support Transport: The San Antonio Military Adult ECLS Team experience (Lt Col Jeremy Cannon) | Anti-retinal Antibodies as Biomarkers for Laser Induced Retinal Injuries in Rabbits (Dr. Rachida Bouhenni) | Read out Loud: The Impact of Military Deployments on Shared Reading Practices in Pre-School Children (Capt Gayle Haischer-Rollo) | A Simulation-Based Program to Improve Non-technical Skills during Cardiopulmonary Resuscitation (CPT Alberto Bonafacio) |
| 10:15 am - 10:45 am | Intraosseous hydroxocobalamin versus intramuscular hydroxylamine in a validated swine model of acute cyanide toxicity and shock (Lt Col Vikhyat Bebartha) | Morphometric analysis of the torso arterial tree in a male trauma population (Capt Nicholay Markov) | Detection of Retinal Proteins in Saliva and Serum in Laser Induced Retinal Injuries in Rabbits (Dr. Rachida Bouhenni) | Potential Burden of Repetitive Concussions in the Pediatric Population (MAJ Dalila Lewis) | Pediatric Critical Care Training Validation Using High-Fidelity Pediatric Simulation (Lt Col Daniel Bruzzini) |
| 10:45 am - 11:15 am | Resuscitation with Hextend Leads to Diminished Inflammation as Compared to Hespan in Hemorrhagic Shock (Dr. Timothy Pritts) | Porcine Arterial Repair with an Extracellular Matrix Bioscaffold (CorMatrix® ECM™) (Dr. Brian Gavitt) | Serum Biomarker Responses in a Non-Human Primate Model of Acute Retinal Laser Injury (Mr. Jeffrey Dunmire) | Concussion Research in Children and Youth (Col Stephen Sharp) | Contemplating a New Model for Air Force Aerospace Medical Technician Skills Sustainment Training (SMSgt Robert Corrigan) |

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| 11:15 am - 12:45 pm | | Lunch Break | | | |
|---------------------|---|---|---|--|--|
| 12:45 pm - 1:15 pm | Epidemiology of Respiratory Illness During Basic Cadet Training at the U.S. Air Force Academy: Implications for Future Research and Prevention (Lt Col Catherine Witkop) | Prehospital interventions performed in a combat zone between November 2009 and December 2010 (Lt Col Vikhyat Bebartha) | Sensors for Monitoring Laser Radiation Exposure (Dr. Richard Preston) | Addressing Sleep Disorders Associated with Mild Traumatic Brain Injury (CDR Michael Handrigan) | Special Needs Assessment and Planning Environment for Emergency Operations Decision Making (Mr. Aaron Miller) |
| 1:15 pm - 1:45 pm | Virulence and Resistance Trends of Staphylococcus aureus in an Outpatient Military Population (Capt Corey Falcon) | Factors Associated with US Military Died Of Wounds Rate in Iraq and Afghanistan (CPT Shimul Patel) | Gene Expression Profile of Jurkat Cells Exposed to High-Power Terahertz Radiation (1Lt Jessica Grundt) | The Association of Post-Deployment Symptoms with Concussion and Post-Traumatic Stress Disorder in US Soldiers Deployed to Iraq or Afghanistan (Dr. Richard Herrell) | Utilization of a Prescreening Instrument for the Selection of Special Duty Personnel (Dr. Joe Wood) |
| 1:45 pm - 2:15 pm | Automation and Assessment of a Whole Blood Interferon Gamma Release Assay (IGRA) for LTBI Screening: The USAF-CDC TB Collaboration (Dr. Donald Goodwin) | Critical Care Air Transport Team (CCATT) short term outcomes of casualties with spinal fractures moved with the Vacuum Spine Board between 2009 and 2010 (Lt Col Vikhyat Bebartha) | Department of Defense Biological Threat Responses to the 2009-2010 H1N1 Influenza Outbreak (Ms. Calli Levin) | VA Screening and Evaluation Data for TBI: Effects of Psychiatric Symptoms and Injury Characteristics (Dr. Alison Cernich) | Benefits of Operational Testing and Why it's Important (Maj James Weinstein) |
| 2:15 pm - 2:30 pm | | Break | | | |
| 2:30 pm - 3:00 pm | How To Get Your Survey Approved (Panel) (AF Survey Control Office) | Continuous Noninvasive Monitoring and the Development of Predictive Triage Indices for Outcome Following Trauma (Dr. Colin Mackenzie) | Expanding Surge Capacity in Airborne Isolation & Worker Protection During Bioterrorism & Epidemic Response (CAPT Kenneth Mead) | Crisis planning for suicidal patients in combat zones (Dr. Craig Bryan) | Healthcare Informatics Roundtable (Col Albert Bonnema) |
| 3:00pm - 3:30 pm | | Efficacy and Safety of Frozen Blood for Transfusion in Trauma Patients, A Multicenter Trial (Ms. Samantha Underwood) | Update on Lab validation of new bioagent ID system: FilmArray (Maj Carlos Maldonado) | Trends in service members seeking combat stress services in remote deployed settings (Capt Sara Wright) | |
| 3:30 pm - 4:00 pm | | Women's Health and Illness Behaviors in the Deployed Setting (Lt Col Candy Wilson) | Next-Generation Sequencing Technology for Disease Detection (Dr. James Baldwin) | Clinical features of mTBI within days of injury in a combat zone (Dr. Craig Bryan) | |
| 4:00 pm - 4:15 pm | | Break | | | |

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| Roundtable Sessions: WEDNESDAY, August 3, 2011 | | | | | |
|--|--|--|--|--|---|
| 4:15 pm - 5:30 pm | Operational Medicine (In Garrison Care) Roundtable (Lt Col Cheri' Shireman) | En-Route Care Roundtable (Air Mobility Command/ Mr. Calvin Griner) | Force Health Protection Roundtable (Maj Colby Adams/ Dr. Welford Roberts) | Human Performance Roundtable (Air Force Special Operations Command) | Healthcare Informatics Roundtable (Col Albert Bonnema)– continue |
| 7:05 pm - 10:00 pm | | | | | |

THURSDAY, August 4, 2011

| 8:00 am - 8:15 am | PLENARY SESSION | DTIC "DoD Research Database" |
|---------------------|------------------------|--|
| 8:15 am - 8:45 am | | Human Compliance Ms. Jessica Candia "AFMS Human Subject Issues and Updates" |
| 8:45 am - 9:15 am | | Animal Compliance LTC David Bentzel "AFMS Animal Use Issues and Updates" |
| 9:15 am - 9:45 am | | Break |
| 9:45 am - 10:15 am | | SG5/SG9 Q & A Panel (Col Chip Terry/Col Patricia Reilly) "Modernization 101: Process and Funding" |
| 10:15 am - 10:45 am | | |
| 10:45 am - 11:15 am | | |
| 11:15 am - 11:30 am | | Break |
| 11:30 am - 12:00 pm | | Maj Gen Thomas Travis, Deputy Surgeon General --Awards Ceremony (Tentative) |

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| Additional Meetings | | | |
|---|---|--|---|
| Monday, 1 August 2011 | Monday, 1 August 2011 | Tuesday, 2 August 2011 | Thursday, 4 August 2011 |
| 10:00 am - 12:00 pm Clinical Investigation Facility Quarterly Meeting BY INVITATION ONLY | 1:00 pm - 5:00 pm Research Management Working Group BY INVITATION ONLY | 5:00 pm - 8:00 pm AFMS Symposium Social Poster Session Casual Attire For All Attendees and Guests | 1:00 pm - 5:00 pm Diabetes and Obesity Research Working Group BY INVITATION ONLY |
| Exhibits and Tables | | Available Rooms | |
| Center for Neuroscience and Regenerative Medicine Continuing Education Credits Defense Center of Excellence for PH and TBI Diabetes Center of Excellence Military Vaccine Agency SG9Z - Innovations Theater Medical Information Program | | Speaker Ready Room Distinguished Visitors Suite | |



Appendix B. List of Attendees

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Appendix C. Continuing Education

This year the symposium granted Continuing Medical Education (CME) and Continuing Nursing Education (CNE) credits for the scientific presentations. Each presentation was worth 0.5 credit. The symposium also granted education credits for Sanitarians and Environmental Health Professionals (Registered Sanitarians [R.S] and Registered Environmental Health Specialists [R.E.H.S.]) from the National Environmental Health Association (NEHA), and Certified Industrial Hygienists (C.I.H.) from the American Board of Industrial Hygiene (ABIH).



Appendix D. Medical Research: A Perspective from the Field

Colonel Elizabeth Bridges

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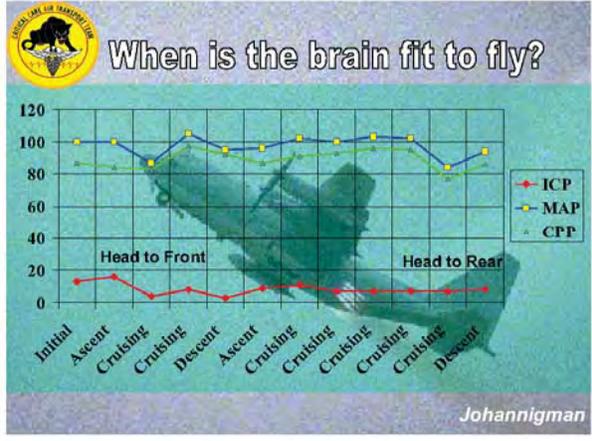

United States Air Force Reserve
Integrity - Service - Excellence

Medical Research
A Perspective from the Field



Col Elizabeth Bridges USAFR NC
 IMA, Director AF Nursing Services

U.S. AIR FORCE
Fly, Fight and Win...



“One Hospital”
 Care & Research Across the Continuum

7000 mile "roadtrip"

Safe Handoff
 Care Across the Continuum

SBAR in AE

Shared Lessons
 Shared Expertise

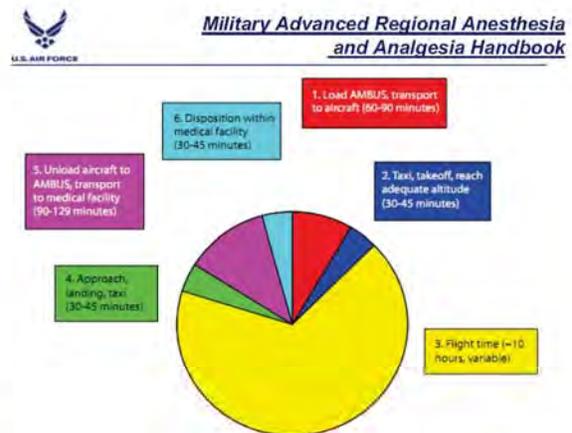
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Designing a Safer OR to ICU Handoff

Pain Management

- “Enroute pain management is an area of care where improvement is needed”
- To assess the adequacy of the patient’s pain control
 - “Shake the patient’s hospital bed to see if it causes increased pain; if so, pain dosing during AE may need to be increased 10% to 20%”

Military Advanced Regional Anesthesia and Analgesia Handbook



Pain Management Across the Continuum
(Gentry 2010)

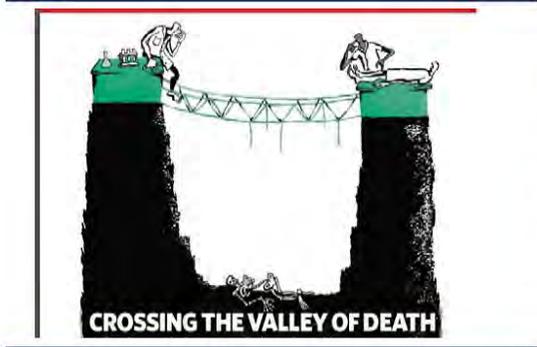
Pain Documentation
 → 3 (7%) had pre-departure pain score
 → 18 (44%) had pain assessment upon arrival to aircraft and/or upon ascent to altitude
Time from hospital departure to wheels up (n = 17)
 → 110 ± 42 min (range 56-240 minutes)
Typical Pre-Departure Med
 → Morphine 1-2 mg or Percocet 1-2 tab



Care Across the Continuum

- Enroute pain management – how are we doing?
- In-garrison pain management strategies
 - Epidural/PNB – Safe translation to expeditionary care
 - Use in patients at risk for compartment syndrome
- Innovative pain management strategies
 - Non-sedative pain management strategies
 - CAM
 - Combination therapies
 - Ketamine–Morphine PCA vs. Morphine PCA vs Dilaudid

Translation
Where Are We?



| | |
|---|---|
| <p>Head Injuries</p> <ul style="list-style-type: none"> Right Time to Move Patient Predictive Biomarkers for TBI Cumulative Effect of Stress of Flight Compliance with CPG during Transport Effect of Altitude on TBI | <p>Spine Injury</p> <ul style="list-style-type: none"> Compliance with CPG CCATT Outcomes of Movement of Casualties with/without VSB |
| <p>Pulmonary</p> <ul style="list-style-type: none"> Physiologic parameters/model that predict ALI/ARDS Right Time to Move Patient Effect of Transport on ALI/ARDS Does autonomous control ventilation improve patient outcomes | <p>Resuscitation</p> <ul style="list-style-type: none"> Early detection of hypovolemia with noninvasive methods Effect of hypotensive or minimum volume resuscitation during MEDEVAC What is ideal resuscitation and what are the indicators and sustainment Do immunogenic and immunosuppressive effects of trauma interventions affect morbidity and mortality |

Enroute Care

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Signature Injury of War

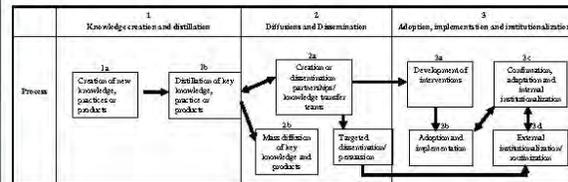


Translational Research

| U.S. AIR FORCE Clinician/Care Challenge | U.S. AIR FORCE Scientist | Clinical Investigator |
|--|---|---|
| Bedside → | Bench → | Bedside |
| Orthopedic Trauma • Bone & Nerve regenerative program • Prophylactic fasciotomy | • Arterial repair with matrix bioscaffold • Morphometric analysis of torso arterial tree | • Surgical Outcomes Surveillance • Functional outcomes and nursing education |
| Vascular Trauma • Military vs. civilian | | • CCATT outcomes for pts transported on VSB |
| Spinal Cord Injury • Spinal injuries following ejection | | |



AHRQ Knowledge Transfer Framework



Nieva, V., Murphy, R., Ridley, N., Donaldson, N., Gombes, J., Mitchell, P., et al. (2005). From science to service: a framework for the transfer of patient safety research into practice. *Advances in Patient Safety: From Research to Implementation* (Vol. 2). Rockville, MD: Agency for Healthcare Research and Quality.



U.S. AIR FORCE

Conclusion
Factors to Consider

- **AFMS Research is/is not Different**
 - What is the military/AF relevant/unique question?
- **Care Across the Continuum**
- **Translational Science**
 - Bedside – Lab - Clinical Research
- **Knowledge Transfer Framework**
 - Knowledge Creation and Distillation
 - Diffusion and Dissemination
 - Adoption, Implementation and Institutionalization
- **Making a Science of Performance**
 - Technology
 - System
 - Vigilance over Performance

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Air Force or the Department of Defense.

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Appendix E. DoD's DCoE for Psychological Health & Traumatic Brain Injury Initiatives

Colonel Christopher Robinson



DoD's DCoE for Psychological Health & Traumatic Brain Injury Initiatives

2 AUG 2011

Col Christopher Robinson, MPH, PhD
 DCoE Deputy Director, Psychological Health



DCoE Current Mission & Vision

Vision

Lead the nation in resilience, recovery, and reintegration for warriors and their families in all areas related to Psychological Health (PH) & Traumatic Brain Injury (TBI)

Mission

DCoE assesses, validates, oversees, identifies, and facilitates prevention, resilience, screening, treatment, outreach, rehabilitation, and reintegration programs for PH and TBI to ensure the Defense Department meets the needs of the nation's warriors, families, and military communities

DCoE Headquarters Structure



Psychological Health

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Table 1. Medical Research Component Summary, Active Component (A) and Reserve Forces

| Medical Facility Counting | Calendar Year 2007 | | | Calendar Year 2008 | | | Calendar Year 2009 | | | Calendar Year 2010 | | |
|------------------------------------|---------------------|----------------|-----------------------|---------------------|----------------|-----------------------|---------------------|----------------|-----------------------|---------------------|----------------|-----------------------|
| | Number of New Cases | % of New Cases | % Population Affected | Number of New Cases | % of New Cases | % Population Affected | Number of New Cases | % of New Cases | % Population Affected | Number of New Cases | % of New Cases | % Population Affected |
| Active | 17,156 | 81 | 10,507 | 87 | 10,005 | 75 | 11,919 | 79 | 13,027 | 81 | 12,017 | 80 |
| Inpatient | 22,148 | 173 | 44 | 28,519 | 189 | 48 | 28,206 | 182 | 51 | 32,371 | 197 | 51 |
| Outpatient | 2,323 | 14 | 62 | 2,552 | 16 | 62 | 2,547 | 16 | 63 | 1,951 | 14 | 63 |
| Ambulatory Care/Physician | 7,292 | 44 | 19 | 8,100 | 55 | 17 | 9,938 | 63 | 19 | 4,421 | 32 | 19 |
| Ambulatory Care/Nurse | 2,533 | 15 | 21 | 2,492 | 16 | 20 | 2,564 | 16 | 22 | 1,873 | 14 | 22 |
| Service members with any condition | 35,236 | 208 | 63 | 38,644 | 242 | 71 | 38,438 | 247 | 74 | 40,411 | 248 | 74 |
| PTSD | 1,241 | 145 | 21 | 1,036 | 112 | 23 | 1,013 | 103 | 34 | 1,248 | 143 | 34 |
| Major Depression | 15,103 | 261 | 62 | 14,571 | 262 | 62 | 14,706 | 266 | 67 | 13,713 | 262 | 68 |
| Bipolar Disorder | 1,182 | 23 | 03 | 1,424 | 27 | 03 | 1,520 | 28 | 04 | 1,407 | 27 | 04 |
| Personality Disorders | 3,922 | 22 | 10 | 4,487 | 38 | 21 | 5,140 | 36 | 23 | 2,292 | 34 | 23 |
| Substance Dependence | 1,842 | 28 | 03 | 1,978 | 34 | 24 | 2,207 | 37 | 25 | 1,991 | 34 | 24 |
| Service members with any condition | 18,688 | 392 | 88 | 17,482 | 442 | 92 | 17,584 | 442 | 94 | 17,798 | 403 | 94 |
| PTSD | 1,188 | 122 | 05 | 1,217 | 127 | 09 | 1,262 | 122 | 04 | 1,357 | 117 | 09 |
| Major Depression | 1,874 | 248 | 31 | 4,151 | 759 | 38 | 4,444 | 742 | 37 | 1,932 | 312 | 38 |
| Bipolar Disorder | 454 | 14 | 02 | 427 | 12 | 02 | 417 | 12 | 02 | 349 | 10 | 02 |
| Personality Disorders | 1,522 | 42 | 20 | 1,990 | 42 | 22 | 2,276 | 44 | 22 | 1,448 | 34 | 20 |
| Substance Dependence | 264 | 08 | 01 | 297 | 09 | 01 | 293 | 08 | 01 | 112 | 07 | 01 |
| Service members with any condition | 4,888 | 242 | 55 | 4,798 | 263 | 57 | 4,614 | 218 | 54 | 3,895 | 215 | 58 |
| PTSD | 802 | 11 | 01 | 1,100 | 14 | 01 | 1,502 | 23 | 03 | 951 | 14 | 01 |
| Major Depression | 17,792 | 122 | 51 | 3,179 | 123 | 52 | 3,228 | 117 | 62 | 1,626 | 124 | 52 |
| Bipolar Disorder | 854 | 02 | 02 | 281 | 02 | 02 | 297 | 03 | 02 | 191 | 02 | 02 |
| Personality Disorders | 873 | 02 | 04 | 791 | 23 | 04 | 793 | 24 | 05 | 388 | 24 | 05 |
| Substance Dependence | 181 | 03 | 01 | 482 | 18 | 01 | 215 | 07 | 01 | 116 | 07 | 01 |
| Service members with any condition | 4,742 | 152 | 61 | 4,881 | 159 | 63 | 4,789 | 153 | 64 | 2,168 | 158 | 64 |
| PTSD | 1,706 | 37 | 12 | 2,121 | 112 | 17 | 1,888 | 34 | 18 | 888 | 37 | 18 |
| Major Depression | 2,244 | 128 | 22 | 2,375 | 157 | 27 | 3,051 | 153 | 30 | 1,820 | 142 | 32 |
| Bipolar Disorder | 288 | 11 | 01 | 221 | 14 | 01 | 264 | 14 | 02 | 128 | 12 | 02 |
| Personality Disorders | 1,461 | 12 | 01 | 1,722 | 18 | 13 | 1,710 | 18 | 13 | 128 | 12 | 10 |
| Substance Dependence | 216 | 10 | 01 | 329 | 17 | 03 | 363 | 17 | 03 | 36 | 10 | 03 |
| Service members with any condition | 4,286 | 262 | 62 | 4,388 | 284 | 64 | 5,472 | 267 | 65 | 2,248 | 262 | 67 |
| Major Depression | 2,244 | 128 | 22 | 2,375 | 157 | 27 | 3,051 | 153 | 30 | 1,820 | 142 | 32 |
| Bipolar Disorder | 288 | 11 | 01 | 221 | 14 | 01 | 264 | 14 | 02 | 128 | 12 | 02 |
| Personality Disorders | 1,461 | 12 | 01 | 1,722 | 18 | 13 | 1,710 | 18 | 13 | 128 | 12 | 10 |
| Substance Dependence | 216 | 10 | 01 | 329 | 17 | 03 | 363 | 17 | 03 | 36 | 10 | 03 |
| Service members with any condition | 4,286 | 262 | 62 | 4,388 | 284 | 64 | 5,472 | 267 | 65 | 2,248 | 262 | 67 |

ICD-9 defines an inpatient or an outpatient encounter on different days with ICD-9 diagnostic code (any position) of 309.81; OR inpatient encounter with ICD-9 diagnostic code (any position) of 309.81.

Overall PH Snapshot

TABLE 1. Incident PTSD cases*, US Armed Forces, Active and Reserve Components.

| YEAR | Incident cases (not previously deployed) | Incident cases among OIF/OEF deployers** |
|--------------|--|--|
| 2000 | 1,614 | - |
| 2001 | 1,703 | - |
| 2002 | 1,708 | 138 |
| 2003 | 1,524 | 1,169 |
| 2004 | 1,577 | 3,896 |
| 2005 | 1,647 | 6,784 |
| 2006 | 1,714 | 7,759 |
| 2007 | 2,038 | 11,953 |
| 2008 | 2,369 | 14,164 |
| 2009 | 2,422 | 13,530 |
| 2010 | 1,234 | 6,891 |
| TOTAL | 19,550 | 65,784 |

*PTSD case defined as either two (2) outpatient encounters on different days with ICD-9 diagnostic code (any position) of 309.81; OR inpatient encounter with ICD-9 diagnostic code (any position) of 309.81.

**Deployment to OEF/OIF lasting longer than 30 days

Prepared by Armed Forces Health Surveillance Center (AFHSC); 10AUG2010
Data Source: Defense Medical Surveillance System (DMSS)

PTSD Prevalence

- Over 2.2 million service members have deployed in support of OEF/OIF since 2001
- Clinically diagnosed cases of post deployment PTSD in OEF/OIF equal 2.4% of deployed service members
- The true prevalence of PTSD among OEF/OIF deployers is unknown but likely underestimated primarily as a result of:
 - The well-documented presence of stigma surrounding the reporting of mental health symptoms
 - Differences in survey methodology
 - Study sampling methodology
- Most studies of deployed samples find between 10% and 15% of service members self-report symptoms consistent with PTSD

Depression Prevalence

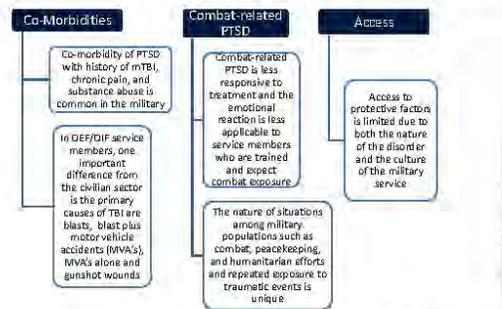
- Self-report surveys find Depression symptoms range from 3% to 15%
- Self-report of Depression symptoms show an increase over time
- Post-deployment problems wider-reaching than formal diagnoses
- Stigma, adjustment problems, relationship & family problems, divorce, risky behaviors, demotions, punitive discharges, etc.

Psychological Health Overview

- Military Psychological Health (PH) is more than mental health care
 - It is a command issue, a readiness issue, a community issue and a medical issue
- Exposure to combat increases the risk for mental health conditions such as post-traumatic stress disorder (PTSD), post-traumatic stress (PTS), depression and substance abuse
 - While some symptoms have survival value in combat (e.g. hyperarousal and hypervigilance) they can also become incapacitating and interfere with psychological adjustment
 - Solution: In-theater mental health providers are forward deployed across Iraq and Afghanistan based on Mental Health Advisory Team results
- Reintegration: Service members receive (and family members are invited) to participate in programs throughout the deployment cycle.
 - In addition to Service programs there are:
 - DCoE Facebook and weekly Blogs
 - DCoE Real Warriors Campaign
 - DCoE Monthly Webinars
 - DCoE Outreach Center

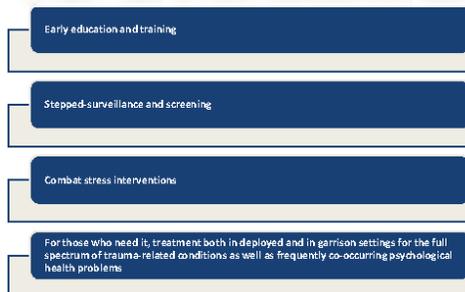
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Unique Issues Within DoD: Co-Morbidity, Combat-Related PTSD, & Limited Access to Protective Factors



10

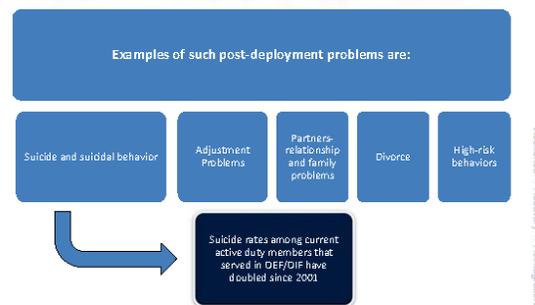
Because of These Unique Features, DoD Combines Various Approaches to Combat PTSD



Resilience • Recovery • Reintegration

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Post-Deployment Problems of PTSD Extend Beyond Formal Diagnoses



Resilience • Recovery • Reintegration

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The Military Health System: Dramatic Increase in Expenditures for Behavioral Health in the Past Five Years

These significant funding allocations make it increasingly vital to identify and promulgate effective programs while reducing or eliminating those that are less effective

The total cost of OEF/OIF in terms of Veteran-related spending is projected to be almost twice that of Vietnam era expenditures, despite the number of OEF/OIF Veterans being less than one-fourth the number of Vietnam-era Veterans

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Co-occurring conditions, and National Guard/Reserve component: two issues of great concern within the MHS

Co-Occurring Conditions

- Co-Occurrence of mTBI and PTSD, termed the "signature injury" of conflicts in OIF and OEF, has received much attention in clinical literature
- Among the U.S. military/Veteran studies, the three largest, most representative studies reported TBI/PTSD prevalence between 5% and 7%
- Among service members with a history of mTBI, two large studies found PTSD prevalence at 33% to 39% of service members
- Extremely limited data exists in published studies on the diagnosis and treatment of co-occurring PTSD and mTBI

Guard and Reserve at Greater Risk

- The National Guard and Reserve Component are at an increased risk for the development of PTSD
- They have additional treatment needs not seen in the active duty components due to geographic dispersion
- Approximately 40% of OEF/OIF deployers are from the National Guard and Reserves

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Additional issues related to PTSD in the MHS: psychopharmacological treatment, and the recent DoD requirements for access to psychological health services

Psychopharmacological Treatment

- Specific issues raised include:
 - Concerns about overuse of prescription medication
 - Multiple medications
 - Non FDA approved ("off label") use of medications
 - Serious adverse events (e.g., accidental death or overdose)

Access

- Improved staffing and innovation strategies such as:
 - Outreach and prevention services
 - Specialty psychological health care
 - Specialized TBI care
 - Primary care based psychological health services
 - Improved primary care capability for TBI
 - Improved inpatient care

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PH Resources

- The Real Warriors Campaign
- 24/7 Call Center
- Military OneSource
- afterdeployment.org
- DCoE Facebook, Twitter, YouTube, Blog
- DCoE Newsletter
- Multiple Mobile Smartphone Applications
- Yellow Ribbon Reintegration Program
- DCoE Webinars
- Major Conferences
- SPARRC Website
- DoD/VA Working Group
- Center for Deployment Psychology Training
- Respect-Mil
- Handbook for Family & Friends of Service Members Before, During and After Deployment
- In Transition Program
- Sesame Street Family Connections and Toolkit
- TBI Family Caregiver Guide
- mTBI and Co-Occurring Disorders Toolkit
- Web-Based Case Studies for mTBI
- mTBI Pocket Guide
- Major Depressive Toolkit (MDD)

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Traumatic Brain Injury

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DoD TBI Definition (Oct 07)

Traumatically induced structural injury or physiological disruption of brain function as a result of external force to the head

New or worsening of at least one of the following clinical signs

- Loss of consciousness or decreased consciousness
- Loss of memory immediately before or after injury
- Alteration in mental status (confused, disoriented, slow thinking)
- Neurological deficits
- Intracranial lesion

DoD definition parallels standard medical definition:

- Centers for Disease Control, World Health Organization, American Academy of Neurology, American Congress of Rehabilitation Medicine

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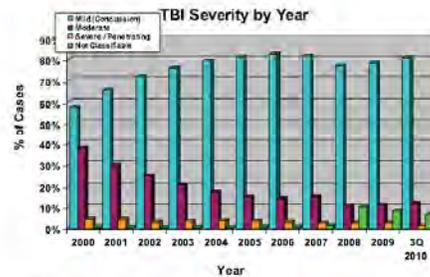
U.S. Military TBI Diagnoses

| 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011Q1 | TOTAL |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| 10,963 | 11,830 | 12,470 | 12,894 | 13,312 | 12,211 | 16,356 | 23,174 | 28,567 | 29,255 | 31,243 | 9,861 | 212,742 |

- SOURCE: <http://www.dvbic.org/TBI-Numbers.aspx>
- Compiled using electronic medical records – represent actual medical diagnoses of TBI in the US Military

19

Tracking the Impact: TBI Severity Data



Original Data Source: www.dvbic.org

20

Continuum of Care



21

Prevention

Head-borne system

- Improve protection from ballistic threats
- Reduce injury from blast events

Use of seat belts/ PPE

Sports related injuries

- Helmets

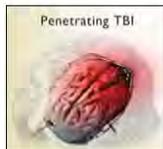
Public awareness campaigns aimed at educational and prevention strategies

- CDC: Head's UP

22

TBI Clinical Standards: Severity, Stages, Environment

| <i>Types of TBI</i> | <i>TBI Post-Injury Stages</i> | <i>Levels of TBI Care</i> |
|---------------------|-------------------------------|---------------------------|
| Mild | Acute | In-theater |
| Moderate | Sub-Acute | CONUS |
| Severe | Chronic | In-patient |
| Penetrating | | Outpatient |
| | | Community |



23

Short-term Impact of Concussion on the War Fighter



24

What's New in Treatment of TBI?

Clinical Practice Guidelines

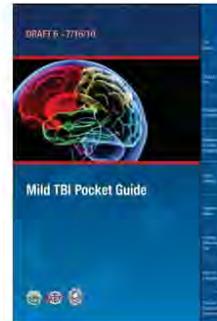
- TBI clinical practice guidelines and clinical support tools, profiles and analysis
- Cognitive rehabilitation of TBI
- Literature review on managing severe TBI
- Literature review of altitude effects on TBI
- Literature review on sleep and TBI
- Neuroendocrine sequelae of TBI literature review
- Toolkit for Treating mTBI and Co-Occurring Conditions

Rehabilitation / Recovery / Reintegration

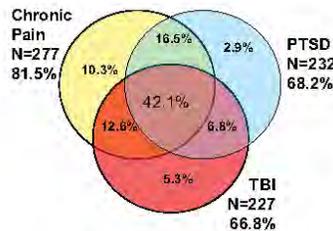
- DVBC - Virtual TBI Clinic (VTC)
- National Intrepid Center of Excellence (NICOE)

Dissemination to the field

Mild TBI Pocket Guide



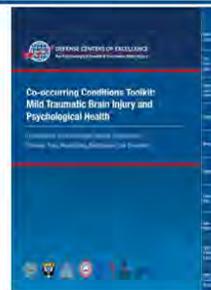
Co-Morbidities Associated with mTBI



- Sleep disorders
- Substance abuse
- Psychiatric illness
- Vestibular disorders
- Visual disorders
- Cognitive disorders

Lew, et al. "Prevalence of Chronic Pain, Posttraumatic Stress Disorder, and Persistent Postconcussive Symptoms in OIF/OEF Veterans: Polytrauma Clinical Triad". Dept. of Veterans Affairs, Journal of Rehabilitative Research and Development, Vol. 46, No. 6, 2009, pp. 697-702, Fig. 1

Co-occurring Conditions Toolkit



- Assessing and managing patients with co-occurring TBI and PH concerns
- Clinical guidance from VA/DoD CPGs:
 - Concussion
 - PTSD
 - Depression
 - Chronic Pain
 - Substance Use Disorder
- Additional input from SME Panel
- Tips for an effective first appointment
- Clinical assessment and treatment of symptoms (sleep, mood, attention, & chronic pain)
- Patient education tips
- Additional provider resources
- Contact info@dvbic.org to order a copy

Toolkit developed collaboratively by DCoE and Component Centers

What are Our Major Challenges?

- Undetected TBI**
 - Screening/Detection (pre-, intra-, post-deployment)
 - Directive Type Memorandum (DTM)
- Force Readiness/Cultural Barriers**
 - Line education
 - Partnering with the NFL
- Improving Collaborations with VA, Academia and Civilian Organizations**
- Deployment Related Assessments**
 - Neurocognitive Issues after Concussion – e.g. Testing after event or deployment
- Effective treatments**
 - Repeat Concussions
 - Co-Morbidities
- Research**
 - “Fast tracking” for objective markers diagnostic of mTBI



Next Steps/Way Forward



Psychological Health Research Gaps

- PTSD and Depression**
 - Treatment trials on deployment related PTSD among OIF/OEF service members and veterans, especially with co-morbidities
 - Treatment effectiveness trials among veterans with refractory, long-standing PTSD
 - Epidemiological research for accurate prevalence rates for PTSD (not self-report) and co-occurring problems
 - Better understanding of the nature and extent of sexual trauma among males and females
 - Interventions for sub-clinical mental health issues
- Suicide Prevention**
 - Valid prevention training (universal, at-risk populations)
 - Theory-driven, evidence-based treatment studies (in/out patient)
 - Valid suicide screening measure(s)
 - Basic science to validate underlying psychological and biopsychological theories of suicide
- Resilience**
 - Research on resilience and strength based approaches
 - Research on resilience training beginning with entry into the military being continuous and how to encourage help-seeking behavior as a part of our military culture

Psychological Health Research Gaps

- Substance Use Disorders**
 - Co-morbidity of substance use disorders with suicide risk and other disorders
 - Retrospective and prospective studies of prescription and over-the-counter drug use (as related to chronic pain, mental disorders and suicide risk)
 - Studies to compare civilian evidence based selective/indicated interventions for substance abuse to DoD current practices in military treatment settings (e.g., emergency room, behavioral health, substance abuse treatment, etc.)
 - Studies to compare evidence based screening, brief interventions and referral to treatment to the current practices in primary care and behavioral health care settings
 - Evaluation of pharmacological interventions of substance use disorders among veterans with co-occurring disorders
- Family**
 - Research to develop evidence-based prevention and treatment interventions for families and children
 - Research to develop effective evidence-based screening and assessment tools for family and marital functioning
 - Family systems research addressing the interplay between stressors, interventions, military and community networks and care
 - Epidemiological research to determine accurate prevalence rates for spouse and child abuse/maltreatment

TBI Way Forward

| |
|---|
| <p>Detection & Screening</p> <ul style="list-style-type: none"> Complete revisions of PDHA and PDHRA forms (to be finalized Jan 2011), DCoE review of TBI and PH portions. Neurocognitive Assessments: Continue pre-deployment neurocognitive testing and post-event testing where appropriate Develop rapid and effective screening tools for field use. |
| <p>Cultural Transformation</p> <ul style="list-style-type: none"> Continue education to all service members Focus TBI education on Combat Commanders and leaders, bringing responsibility from medical into line Continue to encourage data sharing between DoD and VA |
| <p>Treatment/Rehabilitation</p> <ul style="list-style-type: none"> Continue training every provider treating TBI patients (Service coordination and leveraging) Develop provider education compliance metrics and evaluate the services' and MTF efforts to improve TBI care |

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TBI Way Forward (continued)

| |
|---|
| <p>Treatment /Rehabilitation (cont'd.)</p> <ul style="list-style-type: none"> Establish TBI Programs to validate TBI protocols and procedures used by the Military Health System (MHS) |
| <p>Research</p> <ul style="list-style-type: none"> Continue to fast-track promising TBI research Translate promising research into practice in an expedited fashion when a threshold of scientific rigor has been met to safely institute Neurocognitive Assessments: Complete head-to-head study of cognitive testing tools; explore potential defining of post-deployment normative cognitive scores Continue to work with the VA and other public/private organizations to yield collaborations and products benefitting TBI care |

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TBI Way Forward (continued)

| |
|---|
| <p>Information Technology</p> <ul style="list-style-type: none"> Implement Web-based baseline NCAT data system – anticipated to begin field testing second quarter FY 11 Increase IT infrastructure to support improved EHR communication across agencies and to allow patient tracking Enterprise-wide solutions that allow for capture of medical data from point of injury through reintegration (to include VA) |
|---|

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DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Psychological Health and Traumatic Brain Injury Track

Tuesday, 2 August, 1:00pm-4:15pm
 Wednesday, 3 August, 8:00am-4:00pm
 Room: Maryland 3 and 4



PH/TBI Track

- Focus: current research and technology development efforts in the screening, diagnosis, and treatment of PH and TBI
 - Two perspectives on decompressive craniectomy for TBI
 - Novel non-invasive TBI diagnostic tools
 - The impact of mild TBI (mTBI) and repetitive mTBI
 - Co-occurring disorders for PH and TBI
 - Combat stress and TBI in the deployed setting
 - Interventions for the effects of deployment on military families
 - Programs/strategies to curb substance abuse and interpersonal violence in returning Service members

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Col Christopher Robinson
Deputy Director, Psychological Health
Defense Centers of Excellence for Psychological Health
and Traumatic Brain Injury
Christopher.robinson@tma.osd.mil
301-295-3455





Appendix F. What IT Can Do for the AFMS

Colonel Albert Bonnema

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Headquarters U.S. Air Force

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“What IT can do for the AFMS” 2011 AFMS Research Symposium



Col Albert Bonnema
AFMS CMIO
AF/SG6
2 Aug 2011
v1



Health Information Technology

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- Among the fastest growing careers in medicine
- Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009
 - Office of the National Coordinator (ONC) for Health IT
 - Providing policy and standards for electronic use and information exchange of a nationwide health infrastructure
 - Recognized as a pre-requisite for any widespread improvements in healthcare

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Air Force Informatics Innovation

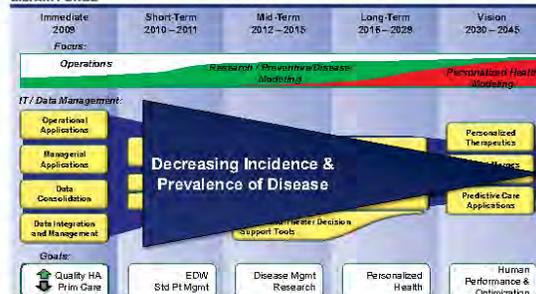
- Immunization and Medical Readiness Registry – mid-1990's
- First Electronic Medical Record, CIW, 1995-2003
- First to aggregate MHS-wide CHCS data for reports, BDQAS
- First to aggregate MHS-wide CHCS data in real-time, COHORT
- First to aggregate and integrate data from multiple source systems, MHS Pop Health Portal
- First to electronically and securely transmit medical record data in flight
- First to create an integrated, Enterprise Data Warehouse with Business Intelligence and Portal Architecture (CarePoint)

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Fusion of Vision and Informatics

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AF and Informatics Research

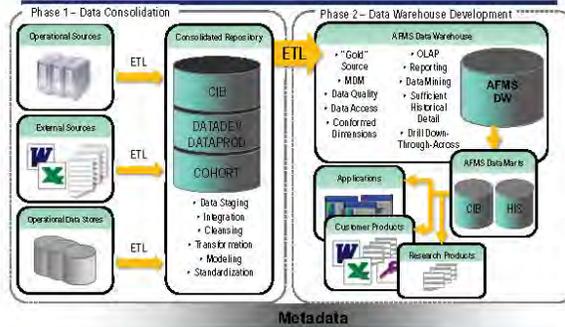
- In May 2011, NIH hosted an AF Clinical Translational Science Award
 - Air Force Medical Service
 - National Institutes of Health
 - Veterans' Administration
 - Food and Drug Administration
 - Agency for Healthcare Research and Quality
 - Industry
 - Care providers and research investigators

- Focus Areas - patient centered outcomes, applied informatics, and pharmacoconomics

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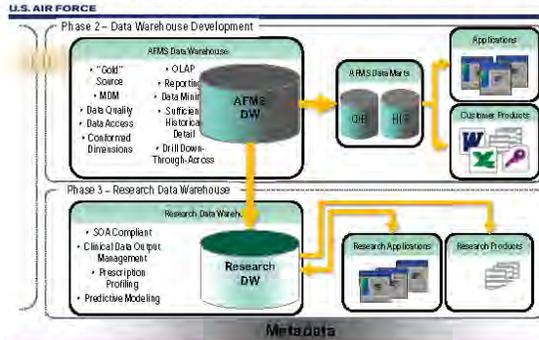
Data Consolidation-2009



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Enterprise Data Warehouse-2011



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Research Data Warehouse

- A Data Warehouse dedicated to Clinical Research
- Virtual Desktop with Analytic and Database tools
- Ability to collaborate in secure but flexible environment
- Support limited data sets, de-identified data sets, and encrypted data sets
- Provide access to partners inside and outside the MHS

- Current Status: configuring a de-identified and encrypted Data Mart

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eHealth Initiative (eHIP)

- eConsults
- Secure Messaging
- Virtual Medical Center
- Clinical Decision Support
- eHealth Home Devices
- Strategic Communication
- AF Medical Modeling and Simulation

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Highlights

- Modeling and Simulation
- Case and Workflow Studies
- Population Health Studies
- The Genomics "Frontier"
- Predictive Analytics
- Surveillance and Screening Methods

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Appendix G. DoD Research Database

Ms. Amy Tursky
Defense Technical Information Center

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Defense Technical Information Center

Submitting to DTIC

Mrs. Amy Tursky
Technical Reports Development Team Lead
Information Collection Division

Approved for Public Release U.S. Government Work (17 USC §165)
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Information for the Defense Community 



Defense Technical Information Center

- Regulatory Requirements
- Benefits
- Controlled Secondary Distribution
- Accepted/Non-Accepted Media
- Where to Submit Documents

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Information for the Defense Community 



Regulatory Requirements

- DoD Directive 3200.12, *DoD Scientific and Technical Information Program*, and
http://stinet.dtic.mil/stinfo/data/DoDD_320012.pdf
- DoD Instruction 3200.14, *Principles and Operational Parameters of the DoD Scientific and Technical Information Program*.
http://www.dtic.mil/dtic/3200_14.pdf

Information for the Defense Community 



Regulatory Requirements

DOD R&D Contracting Reporting Requirements:

- FAR 35.010(a) R&D contracts shall require contractors to furnish scientific and technical reports consistent with the objectives of the effort involved, as a permanent record of the work accomplished under contract.
- DFARS 235.010 Scientific and Technical Reports.
The Defense Technical Information Center (DTIC) is responsible for collecting all scientific and technological observations, findings, recommendations, and results derived from DoD endeavors, including both in-house and contracted efforts.
- DFARS 252.235-7011 Final Scientific or Technical Report.
As prescribed in 235.07(d). The contractor shall submit a copy of the approved scientific or technical report delivered under this contract to the Defense Technical Information Center

Information for the Defense Community 



Benefits for DoD

- Leverages results to maximize large investment in DoD research & engineering
- Prevents unnecessary or redundant research
- Ensures S&T information is only accessible to those who should have it
- Enables the conversion of completed research into the production of mature technology

Real advantages...not just regulations

Information for the Defense Community 



Why Contribute to DTIC

Information Preservation

DTIC still has everything that has ever been entrusted to it—and older information is still used

- Convert new input to full-text electronic documents
- Digitize the archival collection
- Store digital copy off site





Information for the Defense Community 



Why Contribute to DTIC

Adds to DTIC's "institutional memory"

If there is a great technology in the DoD, DTIC should have that information for others to use and build upon.

Information for the Defense Community 



Types of Documents DTIC Receives

| | |
|---|---|
| <ul style="list-style-type: none"> • Technical reports • Test results • Studies and analyses • Journal articles • Proceedings • Theses and dissertations • Patent information • Planning documents • Command histories | <ul style="list-style-type: none"> • Research summaries: <ul style="list-style-type: none"> – Ongoing – Completed • Project details: <ul style="list-style-type: none"> – Objective – Approach – Progress • Organizational details: <ul style="list-style-type: none"> – Funding data – Performing/funding agency/contractor |
|---|---|

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Controlled Secondary Distribution

- DTIC matches:
 - User Registration Authorization
 - Classification and distribution statement markings
- Therefore, all documents and research summaries submitted to DTIC *must have a distribution statement.*



Information for the Defense Community 



Controlled Secondary Distribution

- DoDD 5230.24 Distribution Statements on Technical Documents
 - Release of technical documents provided after primary distribution by other than the originator or controlling office.
 - Includes loaning, allowing the reading of, or releasing a document outright, in whole or in part.
- DoD standard & uniform management approach
 - Common frame of reference and vocabulary
 - For controlling offices that must assign distribution statements and review other requests for release
 - For recipients who need to understand their OPSEC/INFOSEC responsibilities in handling the data
 - Fosters sharing and safeguarding information

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Allow us to tell **someone else** what they can do with **your document** **without asking you.**

Include--

- Intended Audience
- Reason for Restriction
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Remember: Distribution Statements only control secondary distribution

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 Distribution authorized to (Audience); (Reason); (Date of Determination).
 Other requests for this document shall be referred to (Controlling Office)

DoDD 5230.24 Distribution Statements on Technical Documents - <http://www.dtic.mil/dtic/pdf/submits/523024p.pdf>
 DTIC web page - <http://www.dtic.mil/dtic/submits/guidance/dst/state ment.html>

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Where to Submit Documents

Electronic Documents (SF-298):

Email: TR@dtic.mil
 (unclassified-unlimited documents)

STINT-TR Electronic Submission Systems
 (unclassified-unlimited & unclassified-limited documents)
<http://www.dtic.mil/submit/electronic/index.html>

Hard-Copy (SF-298) & Non-Print (DTIC Form 530):

Defense Technical Information Center (DTIC)
 8725 John J. Kingman Dr., Suite 0944
 Fort Belvoir, VA 22060
 Attn: DTIC-OA

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Additional Information

- **Submitting Items to DTIC's Technical Reports Database**
<http://www.dtic.mil/dtic/submit>
- **A Reference Guide for Marking DoD Documents - ADA423966**
<http://handle.dtic.mil/100.2/ADA423966>
- **DoDD 5230.25, Export Control**
http://jtic.fhu.disa.mil/jtic_dri/pdfs/d523025p.pdf
- **For Form 298 & 530 / Private STINET's Scheduled Search Service**
<http://www.dtic.mil/dtic/submit/howtosubmit/howtosubmit.html>
- **Tutorials and Other Guidance for Submitting Documents to DTIC**
<http://www.dtic.mil/dtic/submit/guidance/tutorialsandotherguidance.html>

Information for the Defense Community 



Submitting Technical Reports: Online Resources

<http://www.dtic.mil/dtic/submit/howtosubmit/howtosubmit.html>



Information for the Defense Community 



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| Administrative or Operational Use. To protect technical or operational data or information from automatic dissemination under the international exchange program or by other means. This protection covers publications required solely for official use or study for administrative or operational purposes. This statement may be applied to manuals, pamphlets, technical orders, technical reports, and other publications containing valuable technical or operational data. | | X | X | X | X | | |
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| Software Documentation. Releasable only in accordance with DoD Instruction 7930.2. | | X | X | X | X | | |
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www.dtic.mil Information for the Defense Community 



Appendix H. AFMS Human Subject Issues and Updates

Ms. Jessica Candia
Human Compliance SGE-C

Headquarters U.S. Air Force

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Human Research Compliance



Jessica Candia
AFMSA/SGE-C

2011

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Topics

- Background
- AF Human Research Protection (HRP) Program
- Common challenges
 - Collaborations
 - 10 USC 980
 - Survey Office

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**Presidential Memorandum:
Review of Human Subjects Protection**

MEMO FOR DR. AMY GUTMANN Chair, Presidential Commission for the Study of Bioethical Issues

Recently, we discovered that the U.S. Public Health Service conducted research on sexually transmitted diseases in Guatemala from 1946 to 1948 involving the intentional infection of vulnerable human populations. The research was clearly unethical. In light of this revelation, I want to be assured that current rules for research participants protect people from harm or unethical treatment, domestically as well as internationally.

I ask you, as the Chair of the Presidential Commission for the Study of Bioethical Issues, to convene a panel to conduct, beginning in January 2011, a thorough review of human subjects protection to determine if Federal regulations and international standards adequately guard the health and well-being of participants in scientific studies supported by the Federal Government. . .

While I believe the research community has made tremendous progress in the area of human subjects protection, what took place in Guatemala is a sobering reminder of past abuses. It is especially important for the Commission to use its vast expertise spanning the fields of science, policy, ethics, and religious values to carry out this mission. We owe it to the people of Guatemala and future generations of volunteers who participate in medical research.

BARACK OBAMA, November 24, 2010

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Human Research

- "Human subject" is a living individual about whom an investigator conducting research obtains:
 - Data through intervention or interaction with the individual, or
 - Identifiable private information
- "Research" means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge
 - Research here is NOT defined by:
 - Type of money (e.g., Program 6)
 - Any official label as a "research" program by non-human research protection officials
- 32 CFR 219.102

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DoD and AF HRP Program

- DoD approves and oversees Component HRP Programs
 - Each component must have an acceptable HRP Program to conduct or support human research
 - Elevated HRP Program standards are required for DoD to delegate Assurance approval authority to DoD Components
 - Components without this authority must rely upon others
- AF/SG is the single point of accountability for the AF HRP Program
- AFMSA/SGE-C functions on behalf of AF/SG
 - Oversees the AF HRP Program
 - Is delegated Assurance approval authority
 - Reviews AF conducted or supported human research after Institutional Review Board (IRB) approval

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AF HRP Oversight

- HQ must complete review of this non-exempt research before start
 - AF/SG Human and Animal Research Protection Panel (SGHARP) "approves" complex, sensitive, or greater than minimal risk research
 - SGE-C concurs with non-DoD IRB approval of minimal risk extramural research receives
- Other human research may begin prior to SGHARP review
 - SGHARP concurs with IRB approval of NIH oncology studies
 - SGE-C "audits" AF IRB approved minimal risk research
 - SGE-C reviews intramural exempt research at AF site visits
 - Submit all exempt extramural human research to SGE-C
- SGE-C must ensure compliance and protect subjects
 - Ensure prompt submission!
 - Compliance issues must be resolved!

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Local AF HRP Process

- There can be many different compliant approaches
 - Your institution's IRB's review may not be required
- Give activities due preliminary consideration to ensure they are vetted in the most appropriate and timely manner
 - Early review by knowledgeable persons can prevent unnecessary delay
- Call your IRB early to discuss complicated (e.g., multi-site collaborations) or unusually time-sensitive activities
 - Your IRB should call us with extra complicated issues

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Preliminary Consideration: Any Other Requirements?

- Are other institutions involved?
 - Collaborators and/or involved institutions may add processes
 - Approval of AF Commanders is required prior to:
 - Enrollment of their personnel as subject
 - Use of their facilities for research
- Consider other required processes
 - Determine whether other processes are sequential or concurrent
 - A 10 USC 980 request for waiver of consent will need to be accompanied by IRB approval documentation.
 - Scientific review may be separate from IRB review
 - Attitude and opinion surveys must go to the AF Survey Office

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Collaborations

- Is a DoD IRB required?
 - Who is engaged?
 - DoD IRB is required when DoD is engaged
 - Student research does not require a DoD IRB unless DoD is engaged
 - Some institutions (e.g., USAFA) require an institutional investigator and/or local IRB for use of their subjects
- Is your IRB the right IRB?
 - CC should consider Institutional Agreement for IRB Review if:
 - Your IRB doesn't have / can't get topical expertise
 - Collaborator already has IRB review
 - Multiple IRB reviews are unnecessary

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Collaborations, Cont.

- If an institution engaged in research conducted or supported by DoD will not rely upon a DoD IRB
 - AF HQ must review the institution's full IRB-approved submission
 - Separate IRB reviews can equal differences

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10 USC 980

- AF strictly interprets 10 USC 980
 - AF generally applies where research may affect subjects
 - Reportedly, Army and Navy apply only where the primary purpose is to determine the effect of intervention
 - Prohibits certain research unless:
 - Subjects consent
 - If subjects cannot consent (e.g., incapacitated or minors)
 - Legally authorized representatives must consent
 - Must be potential for direct benefit
 - DoD, collaborators, and DoD contractors must comply
 - Has prevented or significantly delayed research
 - Alteration of Consent Elements (32 CFR 219.116)
 - Deception research may be limited by 10 USC 980
 - Must obtain full, prior, legally effective consent

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Survey Office: *Issues*

- Research conducted without approval
- Lack of appropriate AF level sponsor
- Repeated survey questions on same topic and/or subject
- Survey overload may reduce participation rates for legitimate and needed surveys
- Contracts awarded and funded before surveys are approved
- Surveys hosted on non dot mil domain
- Requirement for digital signature on email invitation
- Protection of data
- Samples too large
- SECAF Initiative to reduce airmen's time on non-mission tasks

Survey demand continues to grow dramatically!

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Surveys

- The process of the AF Survey Office is completely separate from our AF HRP Program and IRBs
 - See AFI 38-501, AF Survey Program
- If you have questions, contact them:
 - Air Force Manpower Agency
 - Performance Management Division
 - Performance Planning Branch
 - Air Force Survey Office
 - Randolph AFB, TX
 - af.surveys@us.af.mil
 - DSN 487-4773
 - Commercial 210-652-4773
 - Air Force AF Portal Web Link:
 - <https://www.my.af.mil/facss-af/USAF/en/global/Tab.do?channelPanelId=s5FDEA9F92134FFA70121351677C90948>

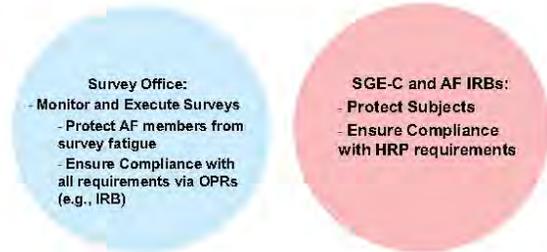
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Separate Missions

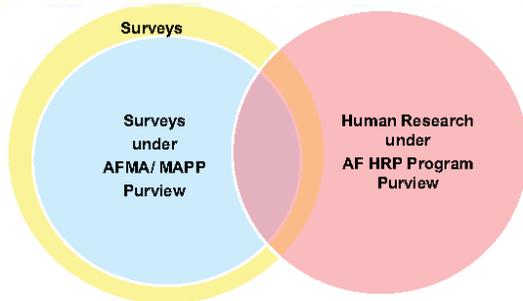


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Separate Scopes

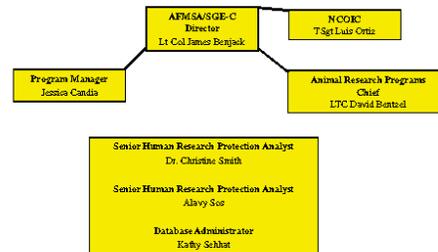


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AFMSA/SGE-C



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AFMSA-SGE-C Contacts

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Questions?

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Appendix I. AFMS Animal Use Issues and Updates

Lieutenant Colonel David Bentzel
Animal Compliance SGE-C

Headquarters U.S. Air Force

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**Animal Research & Training
Compliance**



LTC David Bentzel
AFMSA/SGE-C

2011

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Topics

- Recent Regulatory Changes
 - DODI 3216.01
 - Component Animal Use Management Plan
 - The new "Guide"
- Future Regulatory Changes
 - AFMSA Internal Policy Memo Update
 - AR 40-33 Revision

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Recent Regulatory Changes

- DODI 3216.01 "Use of Animals in DoD Programs"
 - Signed September 13, 2010
 - Expanded to include all research, development, test, and evaluation (RDT&E) or training
 - Doesn't apply to:
 - Ceremonial/recreational or working animals unless specifically used for RDT&E or training
 - Farm animals used or intended for use improving animal nutrition, breeding, management, or production efficiency; or for improving the quality of food or fiber
 - Animals used in disease surveillance, unless the disease screening procedure harms the animal
 - Animals involved in field studies

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Recent Regulatory Changes

- DODI 3216.01 Additions
 - Development and implementation of a CAUMP
 - AAALAC accreditation required with the exception: DoD institutions housing animals for RDT&E or training for less than 8 continuous calendar days.
 - To have a quorum, at least one veterinarian and one non-affiliated member (or alternate) **MUST** be present.
 - Waiver may be granted to meet without the *non-affiliated member* by SGE-C if compelling reason exists
 - Semi-annual facility inspection and program review report to the IO must include a statement indicating the presence or *absence* of minority opinions.

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Recent Regulatory Changes

- DODI 3216.01 Additions
 - DoD Component HQ oversight office must conduct an administrative review and *APPROVE* all RDT&E and training requiring the use of nonhuman primates, dogs, cats, or marine mammals, and all medical training involving live animals.
 - When an IACUC approves significant changes to an approved protocol that was administratively reviewed by the Component HQ oversight office, the Component HQ oversight office must review and *APPROVE* the changes to the IACUC-approved protocol before they can be implemented.
 - The HQ oversight office must be notified within 5 business days if the institution is under USDA investigation, loses AAALAC accreditation, or experiences any adverse events regarding RDT&E or training

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Recent Regulatory Changes

- DODI 3216.01 Additions
 - DoD-supported RDT&E or training
 - Component office must review Veterinary Care Plan
 - Component must ensure the IACUC conducts an appropriate continuing review at least annually
 - USDA inspection reports must reviewed annually for the duration of the protocol
 - Animals must be acquired from USDA vendor unless an exemption criteria is met
 - May waive on site inspection requirement for contractors if facility is AAALAC-accredited.

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Recent Regulatory Changes

- DODI 3216.01 Additions
 - Training
 - Training and education shall integrate Federal policy and guidance that provides national standards for the *acquisition, transportation, housing, control, maintenance, handling, treatment, care, use, and disposal of animals.*
 - All training and education of DoD personnel shall be documented
 - Certification is encouraged for all personnel involved in the care and use of animals in RDT&E or training. (Funding justification?)

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Recent Regulatory Changes

- Component Animal Use Management Plan
 - Purpose: To describe how the AF will implement DODI 3216.01
 - Applies to all programs within the DoD Component and is not restricted by Program Budget Activity, program title, security classification, or location of work
 - Secretary AF, as Component Head, has the authority for implementing the DODI and has delegated that authority to AF Surgeon General
 - The AFMSA Commander, on behalf of the SG, is responsible for oversight of intra and extramural research & extramural providers of training
 - AFMAN 40-401 (AR 40-33) describes how oversight will be executed

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Recent Regulatory Changes

- Component Animal Use Management Plan
 - AFMSA responsibilities:
 - Process to validate all Component personnel connected with the animal use program understand and are qualified to meet their obligation
 - Managing and overseeing a process within the Component that identifies and strives to reduce the possibility for conflict of interest by all personnel
 - Oversight of the Component's policies and procedures for reviewing and addressing allegations of misconduct and noncompliance
 - On behalf of the AFMSA Commander oversight authority is further delegated to Chief, Animal Care & Use Program (SGE-C)

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - BLUF
 - While there are entire new sections
 - e.g., PAM, aquatics, biosecurity, facilities for barriers, imaging and behavioral studies, and space recommendations for rodent breeding, rabbits and some NHP's, etc
 - Most new language addresses pre-existing guidelines
 - e.g., program management and oversight, training, protocol review, endpoints, social housing, disaster planning, role of the AV, surgery, physical plant, etc
 - Strong programs under the 1996 *Guide*, will likely be strong programs under the 2011 *Guide*

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - AAALAC's perspective:
 - Begin using the new standards for September 2011 site visits
 - "Grace period" for "new" mandatory items –will be considered "temporary SFI's" for a period of one year (until September 2012)
 - One year:
 - To implement new "musts" related to program management
 - To equip rooms in which cryogen is stored (MR scanners) with oxygen sensors

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - Three years: for the replacement of cages that do not meet the following performance criteria:
 - "At a minimum, animals must have enough space to express their natural postures and postural adjustments without touching enclosure walls or ceiling, be able to turn around, and have ready access to food and water. In addition, there must be sufficient space to comfortably rest away from areas soiled by urine and feces."

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - Understanding the Guide:
 - **Must:** Indicates actions that are an imperative, mandatory duty, or requirement.
 - **Should:** Indicates a strong recommendation for achieving a goal (individual circumstances might justify an alternative strategy).
 - **May:** Indicates a suggestion to be considered.
 - Engineering standards
 - Performance standards
 - Practice standards

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - Understanding the Guide:
 - **Engineering standards**
 - Performance standards
 - Remains a key concept in application of the Guide
 - Overwhelming support for this approach
 - Better definition of desired outcomes
 - More guidance on how to achieve the outcomes
 - Practice standards
 - The application of professional judgment to a task or process over time, which has been demonstrated to benefit or enhance animal care and use.
 - Many new standards of practice have come into wide use since publication of the 1996 Guide.

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
- Significant Changes:
 - The primary oversight responsibilities in the Program rest with the IO, the AV, and the IACUC.
 - AV **MUST** have sufficient authority (Access to all animals & resources)
 - All personnel involved with the care and use of animals **MUST** be adequately educated, trained and/or qualified in basic principles of laboratory animal science to help assure high quality science and animal well-being.
 - Institutions are responsible for resourcing training
 - The IACUC provides training oversight and evaluates effectiveness of training
 - All Program personnel training **SHOULD** be documented.

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
- Training **SHOULD** be tailored to particular group needs; however, all research groups **SHOULD** receive training in:
 - Animal care and use legislation
 - IACUC function
 - Ethics of animal use and concepts of 3Rs
 - Methods for reporting concerns about animal use
 - Occupational health and safety issues pertaining to animal use
 - Animal handling
 - Aseptic surgical technique
 - Anesthesia and analgesia
 - Euthanasia

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - The medical surveillance program **SHOULD** promote the early diagnosis of allergies and include evaluation of an individual's medical history for preexisting allergies.
 - Personnel training **SHOULD** include information on laboratory animal allergies, preventive control measures and proper techniques for working with animals.
 - While the responsibility for scientific merit review normally lies outside the IACUC, the committee members **SHOULD** evaluate scientific elements of the protocol as they relate to the welfare and use of the animals.
 - Some procedures characterized as minor may induce substantial post-procedural pain or impairment and **SHOULD** similarly be scientifically justified if performed more than once on a single animal.

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - Continuing IACUC oversight of animal activities is required by federal laws, regulations and policies.
 - Variety of mechanisms for PAM:
 - Continuing protocol review
 - Laboratory inspections
 - Veterinary or IACUC observations of select procedures
 - Observation of animals by animal care, veterinary, and IACUC staff and members
 - External regulatory inspections and assessments

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - Disaster Plan - Animals that cannot be protected from the consequences of the disaster or relocated **MUST** be humanely euthanized.
 - Rodent minimum temperature range increased (68-79°F)
 - Performance standard for HVAC air changes (no longer 10-15/hr)
 - Now determined by other variables (heat load, species, # of animals, size, cage change frequency, IVCs, etc.)
 - Extra concern for noise and vibrations
 - Animals housed on wire mesh floor should have resting board
 - Increased focus on environmental enrichment
 - Caution – not all EE is beneficial

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - Social animals should be housed in stable pairs or groups of compatible individuals unless they must be housed alone for experimental reasons or because of social incompatibility. (Default)
 - When animals are maintained in outdoor runs, pens, or other large enclosures, there **MUST** be protection from extremes in temperature or other harsh weather conditions and adequate opportunities for escape and retreat for subordinate animals.
 - General Considerations for All animals. An animal's space needs are complex and consideration of only the animal's body weight or surface area may be inadequate.
 - New space recommendations for female mice and rats with litters.
 - Rabbit cage height has increased to 16 inches

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animal*
 - There is an addition of “rabbits” to those animals that benefit from human interaction.
 - Frequency of bedding changes based on housing and environment
 - There is an entire new section on environment, housing and management of aquatic animals.
- Death **MUST** be confirmed by personnel trained to recognize cessation of vital signs in the species being euthanized.
- Veterinarian **MUST** have authority delegated by senior admin and IACUC to intervene if necessary when responsible person is unavailable or consensus is not forthcoming.

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animal*
 - Major survival surgery (e.g. laparotomy, thoracotomy, craniotomy, joint replacement, and limb amputation) penetrates and exposes a body cavity, produces substantial impairment of physical or physiologic functions, or involves extensive tissue dissection or transection.
 - Use of balanced anesthesia, including the addition of an intraoperative analgesic agent, can help minimize physiologic fluctuations during surgery.
 - Distress may be defined as an aversive state in which an animal fails to cope or adjust to various stressors with which it is presented. (new paragraph)
 - Nonpharmacologic control of pain may be effective and should not be overlooked as an element of the post-procedural or perioperative care for research animals.

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animal*
 - Seven completely new subsections:
 - Barrier facilities
 - Imaging
 - Whole body irradiation
 - Hazardous agent containment
 - Behavioral studies
 - Aquatic species housing
 - Security and access control

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Recent Regulatory Changes

- The 2011 *Guide for the Care and Use of Laboratory Animals*
 - Five new paragraphs
 - Pros and cons of centralized and decentralized animal facilities.
 - Recommendations on windows in animal room
 - Constant-volume HVAC systems
 - Considerations for controlling vibrations within the animal facility
 - Environmental monitoring
 - HVAC systems should be flexible, and daily fluctuations of humidity should be minimized (+/-10% of set point).
 - Programs may need to take into consideration temperature and humidity within some primary enclosures (isolators, etc)

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Future Regulatory Changes

- AFMSA Internal Policy Memo Update
 - Will supersede Apr 6, 2010 memo
 - Very similar – Business as usual
 - Describes what documentation needs to be submitted
 - Discusses site visits
 - Approval vs Concurrence
 - Attempt to unify content between services
 - Elements to be included in AFMAN 40-401

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Future Regulatory Changes

- AFMAN 40-401 (AR 40-33) Revision
 - In progress
 - Will incorporate some of the AF memo
 - Must implement DODI 3216.01
 - Can't be less restrictive than the DODI
 - Changes to DoD Protocol Template & DD2856
 - Must be completed in 18 months
 - Tri-service regulation!

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Contact Information

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- david.bentzel@pentagon.af.mil

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Appendix J. SG9/SG5 Q&A Panel- Modernization 101: Process and Funding

Colonel Patricia Reilly, Director AFMSA SG9
and
Colonel Chip Terry, Director AFMSA SG5

Headquarters U.S. Air Force

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“Modernization 101”



Col Pat Reilly/AFMSA SG9
Mr. Brian McCarty/AFMSA SG5
04 Aug 11

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or
**“What is it that you guys do
up there?....”**



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Agenda

- Air Force Medical Support Agency (AFMSA) (Col Reilly & Mr. McCarty)
- Defense Medical R&D Program (DMRDP) (Col Santullo)

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**Medical Modernization
Mission**

Medical Modernization provides policy, guidance, resources, and oversight to integrate technology and deliver enhanced solutions to the AFMS, our warfighters, and the beneficiary community



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We pursue innovative material & non-material medical solutions...

Support for the Full Spectrum of Medical Care

Next Generation Spinal Immobilization Device

42 units in use in theatre by CCATT teams



Automated Identification Data Collection using RFID technology

Asset Tracking cut from hrs to <2 minutes



Virtual Medical Trainer (VMT)

VMT for C-17 patient loading/unloading created/transitioned to AMC



CCATT Simulator

Simulator mannequin to train CCATT/AE staff



Taking Ideas from Concept to Reality!

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Using this strategy...

Employ a tailored acquisition framework, strategically allocated resources, effective oversight, clear communication & collaboration

to **Deliver Enhanced Capabilities** to

Improve the mission effectiveness of the Air Force Medical Service and our warfighters

Provide policy, guidance, resources, and oversight to integrate technology and deliver enhanced solutions to the AFMS, our warfighters and the beneficiary community

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...in these "Modernization Thrust Areas"

Modernization Thrust Areas



Enroute Care



Expeditionary Medicine



Force Health Protection



Health Informatics



Human Performance



Operational Medicine

Support for the Full Spectrum of Medical Care

Knowledge, Skillsets and Abilities

Aerospace Medicine, Microbiology, Research Modeling, Project Management, Financial Analysis, Physiology, Epidemiology, Nursing, Emergency Care, Enterprise Architecture

Capabilities

Medical Requirements, Strategic Medical Acquisitions, Medical Innovations, Clinical Research Projects, Medical Technology Development, Medical Technology Testing, Medical IM/IT Services, Operations

Delivering The Future Today...One Project At A Time!

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It is Requirements to Solutions...

MAJCOM Requirements

Validated Requirement (Initial Capability Document)

Capability Development Document

Supportability Assessment, Affordability Assessment, Life Cycle Cost Estimate

Analysis of Alternatives

Acquire Preferred Solution

Transition

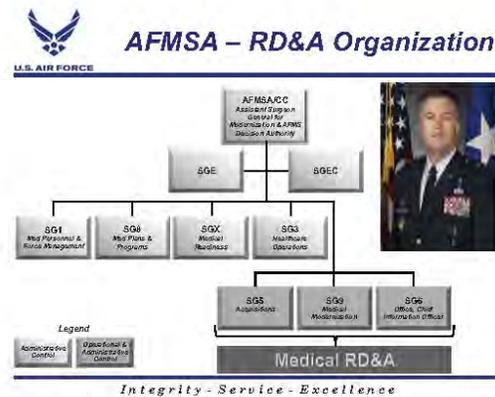
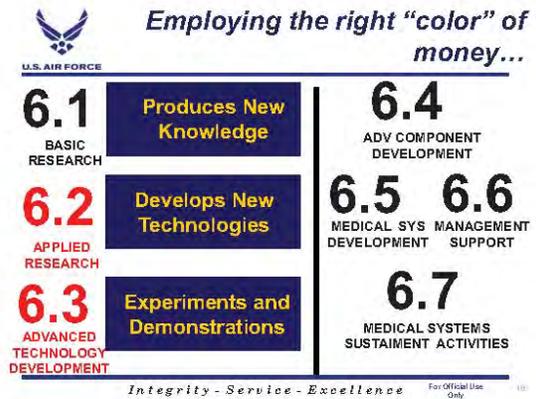
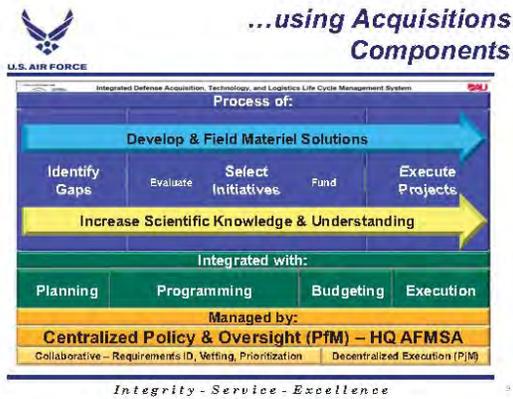
Facilitate the right requirements and deliver the preferred solutions

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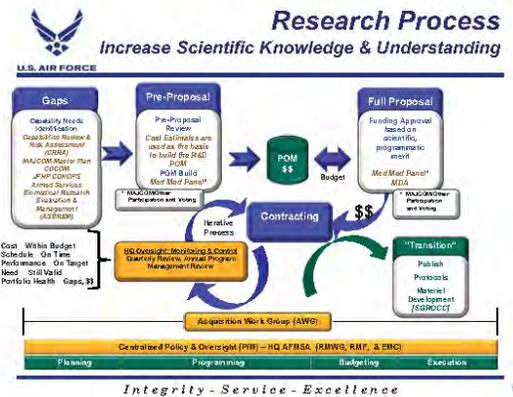
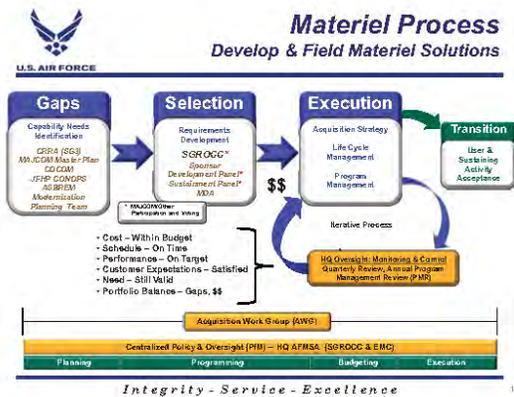
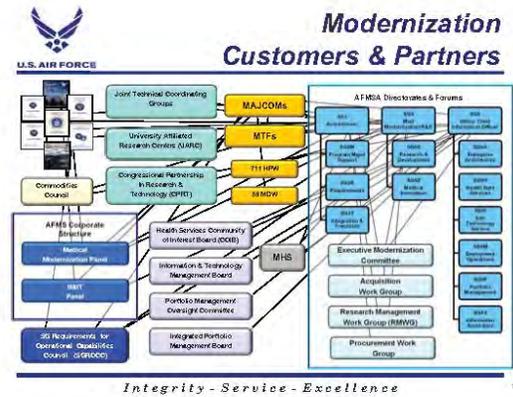
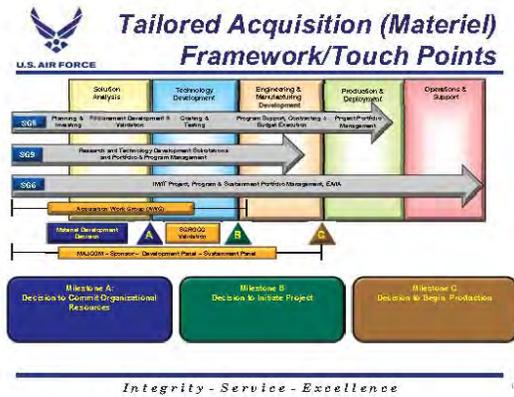
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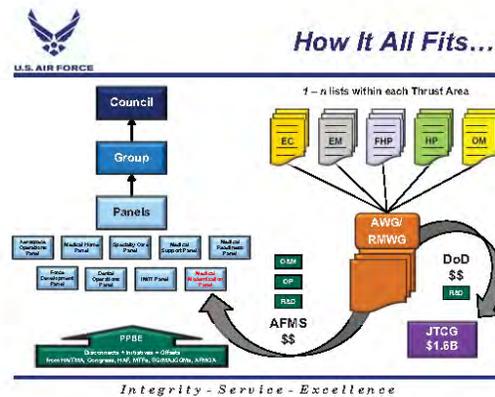
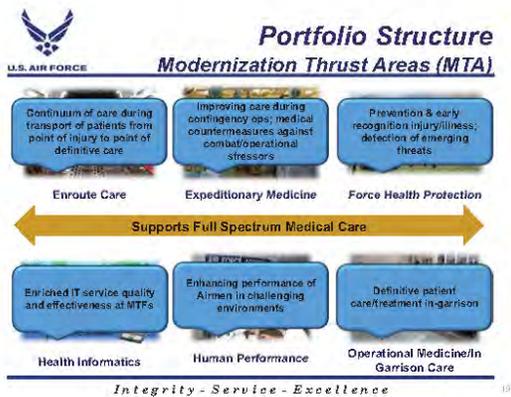
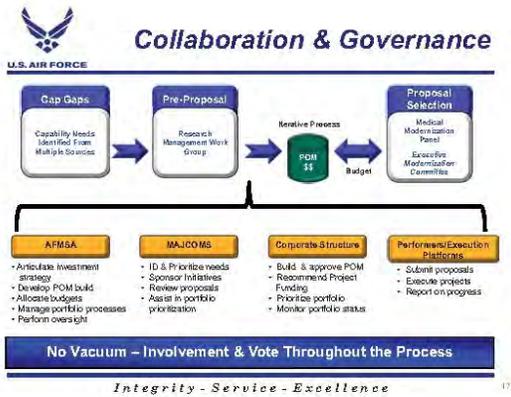
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Looking ahead...

Trauma Specific Vascular Injury Shunt (TS-VIS)
Col (Dr) Todd Rasmussen/59th MDW

Prototype production will overcome the shortfalls of existing vascular shunts & improve the effectiveness of battlefield extremity vascular injury management & limb salvage



LED Wound Healing
Col (Dr) Mike Colvard/University of Illinois at Chicago

Next generation prototype device being assessed for hemorrhage control & tissue cutting capabilities



Cobalamin – A small volume, blood sparing neuroprotective drug for hemorrhagic shock resuscitation
Lt Col Vik Beberta/59MDW

Determine effects of hydroxocobalamin on improving hemorrhagic shock & morbidity/mortality as compared to blood product resuscitation



Taking Ideas From Concept to Reality
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Looking ahead...

CSTARS Cincinnati/711 HPW
Col (Dr) J. Johannigman

- AFMS SMEs for ventilation
- Closed loop control of ventilation



IM/IT
Ms. Susan Chao/SC6
Adjusted Clinical Group Case Mix System

Offers a comprehensive family of measurements designed to help explain & predict how healthcare resources are delivered & consumed

Persistent Monitoring: Sensors/Information

- Smaller/more capable sensors
- Increased amount of data streams
- Integrate sensor/information streams to enhance situational awareness in real time
- Environmental (air, water, soil)
- Public health
- Physiological (pulse/ox/temp/hydration)



Taking Ideas From Concept to Reality
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Looking ahead...

AF Diabetes & Obesity Research Working Group (DORWG)
Dr. Mark True/59MDW

Members include staff from Joint Base Andrews, Keesler, Lackland, Nellis, Travis, & Wright Patterson AFBs

Joint Base Andrews – Diabetes Care Initiative (DCI)

- Established Diabetes Education & Prevention Clinic
- Created referral system for patient enrollment
- Developed secure database for patient metrics
 - 12 GLB programs established
 - DCI patient database has 475 diabetic & 93 pre-diabetic data sets in paper-to-electronic transition
 - Total weight loss of 600.5 lbs



Patient Centered Precision Care (PC²)

- State of the art, evidence-based, personalized care incorporating all available patient information
- Targeted prevention, diagnostics and therapy
- Two parallel efforts
 - PC2-Clinical (Clinical delivery of personalized medicine - Applied Clinical Epidemiology)
 - PC2-Z (Genomic Medicine Research)

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Questions



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Headquarters U.S. Air Force

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DMRDP Primer



Col Ray F Santillo, USAF, BSC
 AF Liaison to JTCGs/RADs
 AFMSA/SG9S
 4 Aug 2011



Defense Medical Research and Development Program (DMRDP)



"...Beyond the recent one-time increase by the Congress for this specific purpose, I request the development of a tailored plan to provide R&D investments that advance state of the art solutions for world class medical care with an emphasis on Post Traumatic Stress Disorder, Traumatic Brain Injury, Prosthetics, Restoration of Sight & Eye-Care, & other conditions directly relevant to the injuries our soldiers are currently receiving on the battlefield." 26 June, 2008

"...Continue the steady growth in medical research and development by requesting \$400 million more than last year." 6 April, 2009
 Robert M. Gates, Secretary of Defense,

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Guidance for Development of the Force (GDF)

| Functional Area | Gap Status (Number of Gaps) | | |
|---|-----------------------------|--------|-----|
| | Green | Yellow | Red |
| Joint Human Performance Enhancement | - | 9 | 24 |
| Joint Health Surveillance, Intelligence & Preventive Medicine | - | - | 3 |
| Joint Casualty Management | 1 | 9 | 14 |
| Joint Patient Movement | - | 2 | 2 |
| Joint Medical Logistics & Infrastructure Support | - | - | 3 |
| Joint Theater Medical Command & Control | - | - | 2 |

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Types of RDT&E Money

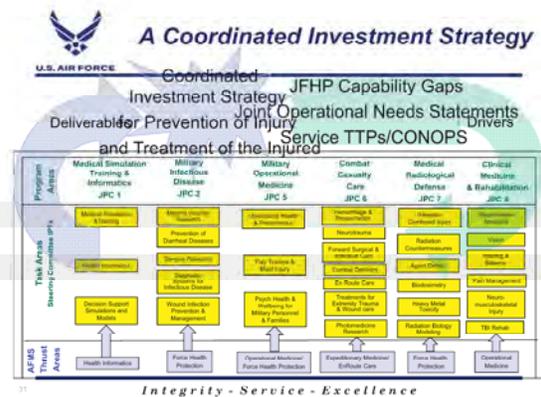
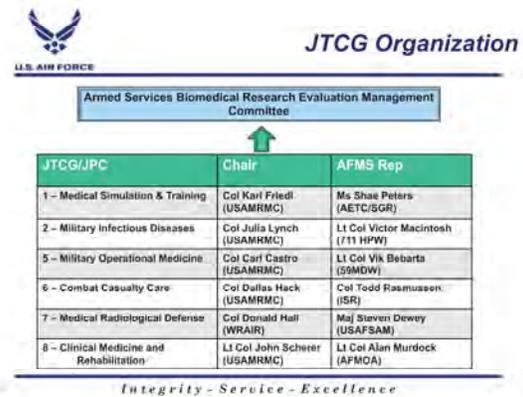
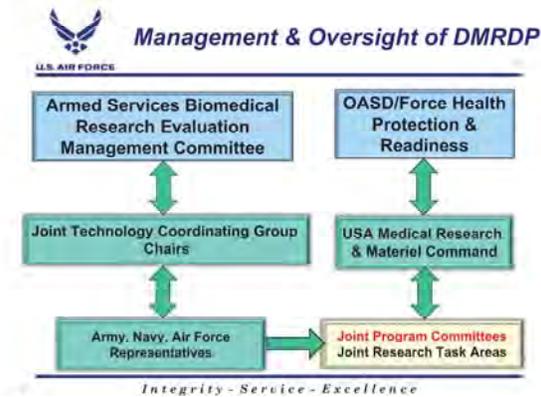
- 6.1 Basic Medical Research Science – attaining greater knowledge and understanding of fundamental principles of science and medicine
- 6.2 Applied Biomedical Technology – refinement of concepts and ideas into potential solutions with a view toward evaluating technical feasibility
- 6.3 Medical Technology Development – development of candidate solutions and components of early prototype systems for test and evaluation, including support of early stage clinical trials
- 6.4 Advanced Component Development – clinical trials for FDA license products and accelerated transition of FDA regulated and non-regulated products and medical practice guidelines to operational users through clinical and field validation studies
- 6.5 Medical Systems Development – development of demonstration of medical commodities prior to initial full-rate production and fielding, including initial operational test and evaluation and clinical trials
- 6.6 Management Support – infrastructure and civilian salary support
- 6.7 Medical Systems Sustainment Activities – pre-planned product improvement of fielded medical products and evaluation of the effectiveness of fielded products, therapies, treatments or medical guidelines

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Volume 1

Plenary Sessions and Abstracts



DMRDP Submission Process

U.S. AIR FORCE

- Program Announcements are posted at grants.gov and/or USAMRAA websites
 - Links to announcements sent to MAJCDW/SGR
- Principle Investigators submit directly to website
 - Read the PA carefully – stay on task
 - Know the timelines
 - Know the type of Award (M vs EM)
- Scientific and Programmatic polish

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JPC Review Criteria

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Scientific/Peer Review Criteria:

- Specific Hypothesis/Aims Impact
- Scientific Rationale
- Approach/Methods
- Personnel Qualifications and Level of Effort
- Technical Risks
- Feasibility of Major Milestones
- Estimated Budget

Programmatic Review Criteria:

- Responsiveness to Research Projects and Tasks
- Programmatic Relevance in Terms of Military Need
- Ratings and Evaluations of the Scientific Peer Reviewers
- Portfolio Balance Across the DOD

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JPC Review Process

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- Review Proposals
 - Each proposal is discussed by assigned reviewers both in terms of scientific merit and programmatic relevance
- Score Proposals
 - All members discuss the reviewers comments and score the proposal, to include comments
- Rank Proposals
 - Sort by average scores, determine funding running totals and establish funding cutoff line
- Evaluate Proposal Ranking
 - Discuss proposals and move above/below funding cutoff line based on research tasks
- Establish Order of Merit List (OML)
- Concurrence Vote by All Members
 - Non concurrence vote requires specific comments

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FY10 DMRDP Investments (\$M)

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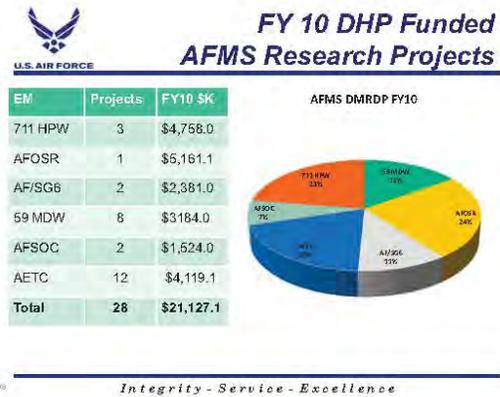
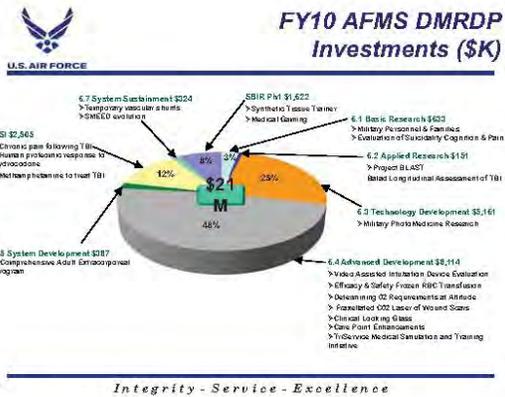
| JPC | Investment (\$M) | Percentage | Medical Research Area |
|------|------------------|------------|--|
| JPC1 | 36.12 | 21% | Clinical & Rehabilitative Medicine |
| JPC5 | 29.24 | 17% | Medical Informatics, Training & Simulation |
| JPC6 | 27.12 | 16% | Military Infectious Disease |
| JPC3 | 27.12 | 16% | Military Operational Medicine |
| JPC4 | 13.76 | 8% | Medical Radiological Defense |
| JPC2 | 13.76 | 8% | Combat Casualty Care |
| JPC7 | 3.56 | 2% | |

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Looking Ahead

| | FY10 | FY11 | FY12 | FY13 | FY14 | FY15 | FYDP |
|------------|---------|---------|---------|---------|---------|---------|-----------|
| | 372,024 | 232,195 | 296,001 | 322,000 | 352,000 | 377,999 | 1,546,399 |
| 66911 DTSP | 35,720 | 0 | 0 | 0 | 0 | 0 | 35,720 |
| 66911 LHSP | 8,181 | 21,254 | 30,324 | 31,119 | 24,100 | 49,313 | 246,307 |
| 66911 LSP | 7,110 | 20,203 | 20,747 | 38,423 | 109,104 | 132,070 | 337,342 |
| 66911 RSP | 138,003 | 160,688 | 170,488 | 146,914 | 105,131 | 77,927 | 835,285 |
| 66911 RSP | 324 | 0 | 18,509 | 64,094 | 31,130 | 38,667 | 275,814 |
| 66911 RSP | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 66911 RSP | 31,000 | 20,000 | 15,000 | 20,000 | 15,000 | 21,000 | 122,000 |

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How Can I Help?

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Closing Thoughts

- If You're Not at the Table You're on the Menu
- The Truth Can Change
- Money in Motion is Money at Risk

